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PUBLISHED UNDER THE AUSPICES

OF THE

MADRAS LITERARY SOCIETY

AND

AUXILIARY OF THE ROYAL ASIATIC SOCIETY.

VOL. VI.

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ROBERT COLE, Esq.

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No. 16.—*July*, 1837.

I.—*Notes on the Code and Historical MSS. of the Siamese and on the Progress of Buddhism to the Eastward.*—*By* Lieutenant T. J. Newbold, *Member of the Asiatic Societies of Madras and Bengal.*

With reference to the subjoined notes on the spread of Buddhism to the east, as connected with the notice of the Siamese MSS. lately presented to the Society, I will briefly state in explanation that, during a period of service in the Straits, my attention was powerfully attracted, by the prevalence of Hindu words in the construction of the language of the Malays, and in the names of places met with in their historical MSS., to a consideration of their literature, religion, and written character prior to the introduction of Mahomedanism.

From the almost total absence of records, among the Malays of the peninsula, anterior to this important era, I was compelled to seek their history through the medium of that of their neighbours, the Siamese —the Aborigines of the peninsula—the Javans, the Bugis, the Battaks, the inhabitants of Menangkábowe, and even from the Chinese. In the course of these enquiries, made, as opportunity offered, from natives of these countries themselves, the great prevalence and antiquity of the religion, and alleged similarity of the written language of the Buddhists of eastern and western Asia came under discussion. The result was an impression on my mind that Buddhism, propagated either from Ceylon or the continent of India (in a few instances supplanted by Brahminism), was originally engrafted on the rude, natural religion of the islanders, on the Sinterism of the people of Japan, the tenets of *Taon*, and the doctrines of Confucius in China—that the Sanscrit, prevailing in the dialects of the most civilized nations of the Archipelago, was introduced through the medium of the *Pali*, the language in which it appears the religious writings of Buddha were brought from

India, and in which Mr. Gutzláff lately heard the Buddhist priests, in one of the islands on the east coast of China, chant the sacred rites of this religion. The religion, language, and its written character will have doubtless suffered considerable change by coming in contact with those of the various nations among whom they have been transplanted, and that the *Páli,* or Sanscrit (as will probably be found the case with regard to the various dialects of peninsular India known under the Brahminical appellation, *Prácrit*) is not the root of the living languages of the Archipelago but merely a graft—as Arabic in the Persian, Malay and Hindustani, and Latin in our own language.

In order that these impressions might be corrected or confirmed by the written evidence of history, I resolved to procure copies of the most ancient annals, codes of laws, alphabets and written characters of the Ultra Gangetic nations, but before the collection had made much progress my Regiment was ordered to Madras. I feel convinced that a careful collation of the annals and sacred books of Burma, Siam, Khohman and Laos in the *Páli* dialects, and of Java and Bali in the *Káwi,* of the religious books and inscriptions of the Buddhists of China and Japan written in the sacred characters of the *Fan-yu** and *Bon-se* (supposed to be modifications of *Páli* derived from India) with those of Ceylon and Southern India, together with the opening of the hidden resources contained in the great native libraries, fac-similes of inscriptions of the Buddhists of *Magadha* and of the *Jainas* of the peninsula,† will by mutual illustration serve to shed considerable light over the chronology and history of India and eastern Asia, as well as to test the forgeries suspected to exist in the apocryphal writings of the Brahmins, and perhaps to solve the long contested point regarding the greater antiquity of the religion and language of the disciples of *Buddha* and *Brahma.* For this purpose the writings of the Brahminical philosophical schools might also be more minutely examined with advantage. Goverdhan Caul (who appears to have been of the Brahminical faith), in his article on the literature of the Hindus from the Sanscrit observes, "We need say no more of the heterodox writings, than that those on the religion and philosophy of *Buddha,* seem to be connected with some of the most curious parts of Asiatic history and contain, perhaps, all that could be found in the *Pâli,* or *sacred language* of the Eastern Indian peninsula."

It is necessary to add that these speculations would not have been

* For the alphabet and specimens of the written characters of these languages I have already written : should they be procured copies, or the originals, shall be forwarded to the Society.

† Many valuable manuscripts on the religion of the *Jainas* collected by Mr. Wathen, are deposited in the library of the Bombay Literary Society ; still, I believe, awaiting translation.

obtruded in their present imperfect form, had not the interest lately excited among Indian *literati* towards the history of this singular and widely extended religion, as regards Ceylon and Southern India, by the announced publication of a translation of the Mahawanso and the promised opening of the Mackenzie MSS., led me to hope that their communication might perchance contribute to stimulate among the many highly talented sojourners in our settlements to the eastward, a corresponding enquiry into the ancient records of the Buddha priests of Japan—China—of the Indo Chinese nations, and of the aboriginal tribes of the Indian Archipelago, as they stand in relation to those of India and Ceylon. In this spirit the following notes are proffered. The inferences and quotations they contain are adduced rather with the view of courting investigation, than for the purpose of establishing a theory.

The historical records of Siam may be divided, like the nation itself, into two classes—the ancient and the comparatively modern. The *T'hay J'hay* and the *T'hay.* I am not aware that copies of the former have ever been procured by European collectors; though, from the testimony of Leyden, corroborated by that of several intelligent Siamese with whom I have had oral communication on the subject, there can be little doubt of their existence. According to La Loubére, who visited Siam in 1687-8, the *T'hay J'hay* or ancient nation of Siam was then in a state of barbarity compared with the more modern *T'hays.* Leyden distinctly states that they were formerly famous for their learning and the power of their empire, that many monuments of this ancient race still exist in the kingdom of Siam, and that in the vicinity of Ligore, there are various ancient inscriptions on stone, among the ruins of a very ancient temple, which are attributed to the *T'hay J'hays,* but which no person among the moderns was able to decipher. The annals of the *T'hay* dynasty, according to the same author, commence only from the building of the city *Maha Nakhon,* a little more than 1400 years ago. The ten volumes MS. now sent to the Society constitute a portion of this modern version, commencing in the 712th year of the Siamese era. The book of laws is a compend of the civil code of Siam; it is divided into two parts—the first comprises an introduction and a chapter containing 33 sections, embracing regulations for the protection of agriculturists, trespasses committed both by men and animals—stealing of rice, agricultural implements, water for purposes of irrigation, removing of land-marks, &c. Part the second contains 12 chapters with an introduction and preamble. It treats principally of the fines and punishments for making false claims to the property of others, pawns, mortgaged lands, water-rights, recording of deeds, the laws of borrowing, buying and selling, gambling, quarrels, the properly securing of elephants, cattle, &c. and concludes with a

chapter of regulations against sorcery, witchcraft, administering love philtres and potions, to cause madness or abortion, and against improper exposure of corpses. The leading feature in the land regulations is the right of the sovereign to all land ; a law which appears to prevail almost universally both in the Malay peninsula and Indian Archipelago. In fact there appears to be a family resemblance in all these codes; which it would not be devoid of interest to trace to its source.

I shall endeavour to procure a copy of the more ancient records of Siam ; which, it may be reasonably surmised, will throw much additional light on the obscurity that shrouds the origin of this singular nation, and on the introduction of the religion of *Buddha* into Siam ; the history of which is intimately connected with that of almost every nation from the mouth of the Indus to the eastern confines of Asia. The Buddhism of Siam is said to resemble the form prevailing in Ceylon, more than the Buddhism of China, Tartary, Hindustan and Japan : but this point requires more careful consideration and analysis. It appears to be certain that both the Burmese and Siamese acknowledge to have received their religion from Ceylon, though it is probable the former received it through the ancient *Magas* or *Mughs* of Aracan. *Buddha* it is well known is supposed to have been born at *Cicatá*, a place said by the learned author of the *Bhagawatomarita* to have been a wood near *Gaya*, an ancient city of south Bahor or *Magadha* the kingdom of *Bali*, through which flows the river *Fulgo*,* supposed by Major Wilford to be the *Caenthis* of Arrian. The date of his birth or incarnation is fixed by Sir W. Jones at about 1,000 years† before Christ. Major Wilford informs‡ us that the ancient and most extensive empire *Magadha* was named from the families descended from the sage Maga, the offspring of the Sun and the grandson of the venerable *Twashtah* in the west, and who came into India in the time of Krishna, from these are sprung the *Magas* (or Mughs) of Bengal and Arracan. The old kings of *Magadha* gave great encouragement to learning, and it is said there were elaborate treatises on religion and almost every science in the *Magadhi Báli* or *Pali* dialects. Major Wilford it appears was not successful in his researches to obtain copies, which he supposes, if they do exist, are to be found among the followers of *Jaina*. The high degree of civilization and commercial influence of the empire of *Magadha* and the city of *Pali Putra*, the supposed *Palibothra* of Ptolemy, said by Diodorus Siculus to have been built by the Indian Hercules *Bala*, is attested by Arrian in his Periplus, and in the *Pentingerian* tables. Major Wilford mentions having seen an inscription in *Páli*, found in Bahar, written in the Burmah character, which

* As. Res. IX. page 32. † As. Res. II. page 125. ‡ As. Res. IX. page 74.

he was unable to decipher. According to Mr. H. T. Colebrooke,* the religious books of the Jains are written in the Prácrit called *Magadhi*, which he believes to be the *Páli* of Ceylon, and cites one of their works, the *Calpa Sútrá* composed about 1500 years ago, written in this language, observing that the Sanscrit language is used by the *Jainas* for translations or for commentaries, on account of the great obscurity of the Prácrit tongue.

Major Wilford with considerable ingenuity and much research traces the intercourse that formerly prevailed between Magadha, Nepal, Thibet and China. But the spread of Buddhism southerly to the peninsula of India and the island of Ceylon, is by no means satisfactorily elucidated. The translations of the Mackenzie MSS. and that of the *Mahawanso* will throw much light, it is to be expected, on this part of Indian history, as well as on the expedition of *Rama* and the expulsion of the *Jainas*, who are identified with the Buddhists. It is certain that at a very early period fierce disputes arose between them and the Brahmins, which terminated in the expulsion of the former from the shores of India. Many took refuge in Ceylon, and probably some few contrived to escape to Java, Sumatra and other islands to the eastward.

Date of Expulsion from India. The date of this event or events, as well as that of the expedition of *Ráma*, with which perhaps the first persecutions of the Buddhists by the Brahmins may be found to be connected (Hémachundra, an ancient Jain author enumerates among the nine foes of Vishnu the king of Lanca Rávaná, and the king of Magadha, Jará Sandha both probably worshippers of Buddha (As. Res. IX—316), are epochs, the fixing of which I take to be of considerable importance in Indian history. Their final expulsion from the Deccan was not effected, according to Mr. Chambers, until so late as the 9th or 12th century of the Christian era ; and, according to the Hindu author of a history of Cashmir translated by order of the emperor Akber, it was not till the reign of *Naikh* the 59th prince of Cashmir, that the Brahmins of Cashmir got the better of the followers of *Buddha* and burned down their temples. Dr. Francis Buchanan† fixes the reign of *Naikh* at about A. D. 342.

Arracan and Burma. We shall now attempt to trace this singular religion eastwards. It appears certain that the people inhabiting the countries immediately to the eastward of the empire of *Magadha* soon adopted the tenets of *Buddha*—among the rest the *Mughs* or *Magas* of Arracan ; from which nation, Buchanan is of opinion, the Burmese received their religion, laws, and government, about 600

* As. Res. IX. page 310.

† As. Res. VI. 165.—Mr. Colebrooke asserts (As. Res. IX. 294) that this passage cited by Dr. Buchanan is not supported by the Persian or Sanscrit text.

years ago; though by the Burmese themselves a much earlier date is ascribed to this event.* Buchanan himself admits that the Burma code, more than 600 years old, was introduced from Ceylon; and, according to their own chronological tables, procured by the late embassy, their first monarchs are said to have come† from Magadha, more than 300 years B. C.

Colonel Symes states, " As an incontestible proof that the Burmans acknowledge the superior antiquity of the Cingalese, and the reception of their religion and laws from that quarter, the king of Ava has sent, within these few years, at separate times, two messengers, persons of learning and respectability, to Ceylon, to procure the original books on which their tenets are founded; and in one instance the Burman minister made an official application to the Governor General of India to protect and assist the person charged with the commission." It seems a reasonable conclusion from the statements, as well as from what the Burmese themselves aver regarding the antiquity of their religion, that it originally came, before the Christian era, through Arracan, from the empire of *Magadha* direct—that on the decay of this Buddhist empire and ascendancy of the Brahmins, they were compelled on religious matters to communicate with Ceylon; the sanctity of which island must have been considerably increased by the influx of Buddhist priests from India.

Siam. The introduction of Buddhism into Siam, I am assured by several natives of that country, took place at a very remote period from Ceylon; these assertions are corroborated I find by their popular records, which are remarkably clear and decisive on this head; for instance‡, " Five hundred years after the decease of *Samono Godon* (Gaudama), there were three kings in the island of Ceylon, who, together with the *rahans* or priests, assembled to consult on matters of religion. One of the kings inquired, whether any person present had ever seen the deity during his life time. All replied in the negative. One of the *nâks*, knowing their conversation, instantly left his residence, came through the air, and presented himself in their assembly, saying, that he had seen the deity during his life time, and could create a perfect representation of him. This he accordingly did, and the kings and people sacrificed to it for seven days, and seven nights successively. The *nâk* then assumed a human form, and prostrated himself in humble adoration before the priests; after which he resumed his own nature and returned home, and with him disappeared his representation of the deity. But the kings, priests, and people

* As. Res. VI. p. 302. † Hamilton's Gazetteer—art. Ava.

‡ Chinese Repository, vol. IV. p. 177.

determined to make a brazen image of it. One of the workmen employed in casting the image, offended one of the kings, who struck him and wounded his forefinger. The power of fate following this act of the king, destroyed one of the fingers of the image. This king proposed to replace it, but one of the priests dissuaded him, and by his knowledge of futurity prophesied that at some future time the statue should be conveyed on the great sea (the bay of Bengal), to the extremity of its waters, where a great king should replace the deficient finger.

" In the year 700 of the Buddhist era, there was a mighty monarch governing Siam, whose capital was Soökcoty ; his fame extended from the Ganges to China, and from the extreme north to the ocean (gulf of Siam). He had heard of this famous image in Ceylon, and wished to sacrifice to it: and to effect this he employed the rajah of Ligore to send an embassy and beg it of the Ceylonese king. That king being reminded of the ancient prophecy consented. On the passage back, the ship was sunk, and all the seamen perished; but the image, possessed of *innate glory* (which is proved at large in the Buddhist books), floated towards the country of Ligore, seated on the back of the great ocean (bay of Bengal). The rajah, admonished of the fact by a *taywadah*, who appeared to him in a dream, sent vessels to receive it, and prepared a great abundance of offerings (which, after being presented, he was careful to take away). The image being so graciously received, made a display of its wonderful power, by rising of itself, and floating about in the air. Astonished at this, the rajah hastened to inform the monarch of Siam, who after innumerable offerings conveyed it to his capital." It may be remarked that the idol was received at Ligore, where mention is made by Leyden, of a very ancient temple alluded to in the early part of this note.

The Siamese, according to Leyden, have also traditions that their religion was introduced from Laos; but until the ancient records of this nation and of the *T'hay J'hay* tribe can be examined, we must be content with the inference that they were indebted for their religion to Ceylon, about the 2d century of the Christian era.

Laos, Cambodia, Cochin China, and Tonquin. Regarding its introduction into the countries lying between Siam and China, viz. Laos, Cambodia, Cochin China and Tonquin, little is known. The records and sacred languages of these singular countries, are yet *desiderata.* Leyden* states, that it is in the country of *Lân* or Laos, that all the celebrated founders of the religion of *Buddha* are represented to have left their most remarkable vestiges. *Ceylon* boasts of the sacred traces of the left foot of *Buddha*, on the top of the mountain *Ámála-*

* Dissertation on the Languages and Literature of the Indo Chinese nations, p. 104.

Sri-padi, or Adam's Peak. *Siam* exhibits the traces of the right foot on the top of the golden mountain *Swa-na-bapato.* Other traces of the sacred steps, are sparingly scattered over *Pegu*, *Ava*, and *Arracan:* but it is among the *Laos*, that all the vestiges of the founders of this religion seem to be concentered—and whither devotees repair to worship at the traces of the sacred steps of *Pra-ku-ku-sôn*, *Pra-kôn-na-kôn*, *Pra-put-t'ha-kat-sop* and *Pra-sa-mût-ta-ko-dom.*

The description of Cambodia by a Chinese traveller, translated by Remusat, mentions the prevalence of three great religious sects there, viz. the *Chon-kon*, or Buddhists, the *Pan-ke*, or literary sect, and the *Taon-passe.* These would appear to correspond with the *San-kon* or three religions of China, viz. those of *Confucius*, *Buddha*, and that of the philosophers or heretics, as the disciples of *Laon-keun* are styled.

The city of Saigon in Cambodia, we are told by Lieut. White, of the American Navy, in his account of Cambodia, is crowded with temples dedicated to *Buddha* similar to the Chinese pagodas.

China. Sir Wm. Jones, in his seventh discourse, on the Chinese, states his opinion that the religion of Buddha or *Fo** was introduced into China from India in the first century of our era. Major Wilford with more minuteness fixes the date of its introduction in the year 65 A. C. This he does on the authority of Pliny, which amounts merely to the report of one of the four Cingalese ambassadors to the emperor Claudius, who began his reign in 44 A.D., that the *Seres* (Chinese?) lived beyond the Haimada or snowy mountains, and that they were often seen and visited by the Cingalese through commercial intercourse, and that whenever caravans from Ceylon went there, the *Seres* came in a friendly manner part of the way to meet them. Major Wilford thinks that there can be no doubt that the Cingalese went first by sea to the country of *Magadha* or the Gangetic provinces: where their legislator *Buddha* was born, and his religion flourished in the utmost splendour; and thence, with the caravans of that country, to China, through the great route mentioned by Ptolemy from *Palibothra.* M. De Giugnes and others prove the subsequent intercourse prevailing between India and China.

As doubts have arisen, notwithstanding the authorities just adduced, regarding the introduction of Buddhism into China from India, we will hear what the Chinese themselves say on the subject. They constantly aver that *Froh* or *Buddha* came from the west. In the west they place his paradise. †The emperor *Ching-Tih*, who died A. D. 1520, meditated sending an ambassador with expensive presents to

* Mr. De Giugnes asserts on the authority of four Chinese historians that Fo was born 1027 years before Christ.

† Indo-Chinese Gleaner vol I. page 150.

India with the view of bringing the most learned of their Buddhist priests into China to explain more fully the original tenets of their sect, a purpose from which his minister *Wang-Yang-Ming*, who was a man of letters and a philosopher, attempted to dissuade him in an eloquent address, wherein allusion is made to the tenets of *Fuh* as a religion which had its origin in the distant countries of the west, and to *Fuh* himself as being the sacred sage of foreigners. It may be here remarked that the Chinese have no character whose initial sound corresponds with B; consequently their pronunciation of the word *Buddh* would be P'hudh, or *Fut*, *Fuh*. The emperor *Mingti*, who is supposed to have flourished during the first century after Christ, sent ambassadors into India, in consequence of a saying of Confucius, viz. that the most holy was to be found in the west, who returned with the books and doctrines of *Buddha*. These did not make much way against the doctrines of Confucius until about 518 A. D. when a Buddhist priest named Darma or D'herma (an Indian name) came into China from *Seitensku* which, says Kæmpfer, according to Japanese explanation, means, that part of the world which lies westwards of Japan. On the island of Honan there is a large Buddhist temple called the *Fut-kaon**, containing many inscriptions indicating the origin of their religion. For instance *Hoe-teen Fok-te* the " happy region near the sea." *Nam-teen-fut-kwok* " the nation of *Buddha* in the southern region."—*Hoe-van Poo-te* " the god *Buddha* on the shores of the sea." Three large images of the *Jam-pow-fut*. The three precious Buddhas, past, present, and future. In this temple there is a single image of *Amida* (immeasurable) *Buddha*; in Chinese called *O-mi-to-Fuh-ti*.

Corea.—Shortly after the appearance of the Buddhist priest *Darma* in China, Buddhism made rapid progress to the east.† The first idol to *Buddha* in the peninsula of *Fakkusai* or Corea was erected in 543 A. D.‡ Professor Wilson states the introduction of this religion into Corea to have taken place A. D. 530.

From Corea it may be traced to Japan and the Chusan group; one of which, the island of Poo-to, was visited lately by Mr. Gutzlaff the missionary.§ The immense number of Buddhist temples and priests, sixty two of the former and two thousand of the latter, on this small island, the area of which does not exceed 12 miles, can only be accounted for by supposing it to be a place of peculiar sanctity where *Buddha* is supposed to have first made his appearance. This is corroborated by the large inscriptions hewn in rocks of solid granite, and the many gigantic statues of Buddha. The highly picturesque

* Indo Chinese Gleaner vol. III. page 236.

† Kæmpfer.

‡ Preface to Sanscrit Dictionary.

§ Quarterly Review, vol. LI. page 475.

scenery of the* island itself, with its "many peaked, riven and detached rocks," and a stately mausoleum containing the bones and ashes of thousands of priests, are confessed by the worthy missionary to have totally bewildered his imagination. The vespers of the priests Mr. G. says were chanted in the *Páli* language, not unlike the Latin service of the Roman church. They held their rosaries in their hands, which rested folded upon their breasts; their service was regulated by the tinkling of a small bell, and they occasionally beat the drum and large bell to rouse *Buddha* to attend to their prayers.

Japan.—Buddhism can be traced distinctly from Corea to Japan (Niphon) in the† 6th century of the Christian era. According to the Japanese annals‡ in the year 552 A. D., the king of Fioksae in the west of Corea, sent an embassy to the *Daii kinméi,* with an image of *Buddha* and his classical books. Professor Wilson states that the year 572 was remarkable for the arrival in that kingdom of an immense number of priests and idols. The Japanese annals inform us that this religion, after having encountered some persecutions, soon triumphed: and that about A. D. 600, two zealots of great influence, one the cousin of the empress, built temples and invited priests from Corea. In A. D. 805, the *Darri kwanmu* caused idols of *Buddha*§ to be placed in the imperial palaces, and the sacred books procured from India to be read and explained in the temples.

The traditions of the Japanese, according to¶ Kæmpfer's Japanese author, relate that about a thousand years ago there was in *Tientensiku* (that is the middle *Tensiku,* whereby must be understood the country of the Malabarians and the coast of Coromandel in India) an eminent *fotoke* called *Mokuren* a disciple of Siaka (the Sacya of Sir W. Jones), and that about this time the idol of *Amida* (*Buddha*) appeared at a plain in Japan called *Naniwa* environed with golden rays.

In an extract from the Chinese work the *Chow-hoe-too-peen* we find, towards the close of the 14th century, that the emperor *Hung-woo* sent a Buddhist priest to Japan with a command for that nation to venerate Buddha.

Mr. Meylan, in his late publication on Japan, published at Amsterdam, states that the *Dairi* or spiritual emperor still allows strange gods to be imported from Siam or China.

* According to Japanese annals in the reign of the successor of the emperor Sensin, who died A. D. 70, a celebrated personage arrived from India riding on a white horse and bearing in his hands a sacred book.

† Chinese Repository, vol. III. page 158.

‡ The period in which the building of the Buddhist temples in Java commenced—Raffles's Java—vol. II. page 86.

§ Chinese Repository vol. III. page 203. ¶ History of Japan vol. I. p. 167.

Loochoo. We find from the Chinese official memoirs* concerning the Loochoos (published first in the reign of *Kang-ke*, about A. D. 1700 and extended to the 13th year of the reign of *Kew-king* A. D. 1808 printed at Pekin) that the people of the Loochoos are followers of *Buddha*, and that they say, about 1275 a Buddhist priest was driven on the island in a boat, whence he came they know not, and that they have had priests ever since. The priest was probably a native of Japan or Corea. Mr. Fisher, a late writer on Japan, saw at Nagasaki some Corean barks, which are occasionally driven on the southern coast of Japan, and it is not very improbable that some may have drifted so far south as the Loochoos.

Sumatra. Having thus far traced the progress of Buddhism from *Magadha* and Ceylon, over the southern regions of the continent of Asia to its most eastern confines, I will attempt to follow its track through the Indian Archipelago. Assuming that the Buddhists, at some very early period, were driven from the shores of peninsular India, it is very reasonable to suppose that many of them would take advantage of the numerous trading vessels lying in the southern harbours, and escape either to Ceylon, or seek a more distant and secure asylum in the ports to the eastward, with which it is a well authenticated fact they had long been in the habit of carrying on an extensive system of commerce. The first land of any importance made would be probably the Tenasserim coast, or the northern extremity of Sumatra, Achin ; and where the general prevalence of mutilated Hindu images is noticed by Sir S. Raffles (Memoirs page 384) ; whence it is fair to suppose that the prows of the refugees would be turned towards *Menangkâbowe*, a very ancient empire the capital of which, *Pagarnyong*, was situated in the heart of Sumatra, and the sway of which extended formerly over the whole of this large and fertile island. The literature, language, and the Buddhist images discovered by Lieutenant Crooke at Jambi, and the *Kawi* inscription in *Menangkâbowe* by Sir S. Raffles, go to bear out this notion. The Revd. W. Taylor, in some learned and obliging remarks on my brief note touching the *Batta* tribe, has fully established the identity with the Sanscrit *(Pàli ?)* of many words existing in the present languages of the neighbouring tribes of Battas. Lieutenant Crooke mentions the existence of a nation of idolaters, in the vicinity of *Jambi*, called the *Kúbus*†, subject to the sultan of Palembang. The strong inclination of many of these tribes in the interior to the doctrine of the metempsychosis (still partially entertained by the Malays both of Sumatra and the peninsula of Malacca), and the religious veneration in which they hold the names of their ancestors, are now the almost only indications of the tenets of *Buddha* which formerly prevailed to a certain extent.

* Indo-Chinese Gleaner, vol. II. page 9. † Appendix to Anderson's Mission, page 389.

Java. The fixing any date for the first introduction of Buddhism into Java must perhaps mainly depend upon that of the expulsion of the Buddhists from the peninsula of India by Brahminical persecution; without we entertain the supposition that this religion was in the first place introduced and taught by the early Buddhist traders from India or Siam, and afterwards established by the subsequent colonizations of the refugees. To the later settlers may be ascribed the erection of temples and idols to *Buddha* and the formation of a regular priesthood. The Javans we know, date the commencement of their era (A. D. 75) from the arrival in Java of a personage named *Adi-Saka* or rather *Saca,* which according to Sir Wm. Jones is a name for *Buddha,* and at all events is the title, according to Major Wilford,* of the six glorious monarchs, who gave rise to six subordinate periods, into which the Caliyuga is divided. The third of these, *Salivahana Saca* was born at *Sa'leya Dha'ra* in the Deccan, and established an era nearly corresponding to that of the Javanese *Saca,* and which is used by the Buddhists and natives of Southern India to this day. In a chronological work of the Javans, said to be written by *Aji Jáya Báya,* we are told that in the 10th year† of the Javan era 20,000 families were sent to Java by the prince of *Kaling* (or *Kalinga*) who prospered and multiplied. Most of the Buddhist temples in Java appear to have been built between the 11th and 14th centuries, corresponding with that ascribed to the final expulsion of Buddhism from India. From Java it may be traced eastward to the now Brahminical island of *Bali.* From those of *Lombok, Sumbawa, Flores* and *Timor* to the confines of New Guinea little is known. The vast unexplored island of Borneo is said to contain ruins of temples, in which are found inscriptions in characters unknown both to the natives of the island, the Chinese, and the Malays. In Celebes is said to exist an ancient and recondite language, like the *Páli* of the Siamese, or the *Káwi* of the Javans. Many of the best informed Pugis assert their Hindu origin, and their language bears evident traces of *Sanscrit* or *Páli.*

Whether it ever reached the Philippines is matter of doubt—the Spanish missionaries on the islands have, it is said, taken great pains to extirpate all the ancient records of the *Tagála* races, in which the history of their religion and the deeds of their heroes were celebrated in poems and songs.

Malay Peninsula. South of the Siamese provinces, few indications are found on the Malay peninsula of the Hinduism which is supposed by many intelligent Malays to have formed the religion of its chief princes, prior to the introduction of Islam, from which the commencement of the authentic history of the Malayan nation can alone be

* Chronology—Kings of Magadha. As. Res, IX. 83. † Raffles's Java vol. II. page 69.

dated. If reliance can be placed on the traditions of the Malays, they possessed religious books and a code of laws written in a character now unknown (probably a modification of the *Káwi*), of which the zeal of their Mahomedan converters have obliterated every vestige. The many Hindu words, in the body of the language, still in use, the frequent allusions in their popular historical romances and poems, to the Ramayana and Mahabharat, contribute to strengthen the plausibility of these traditions. It is certain that, at a very early period, a considerable intercourse subsisted between the peninsula of Malacca, India, and Siam. From one or both of these sources we must attribute the introduction of Hinduism or Buddhism.

In the *Sejára Maláyn* we are informed that *Raja Suran*, the monarch of *Amdam Nagara*, and founder of the city of *Bijanagar*,* penetrated to the southern extremity of the peninsula, with an army amounting to one thousand and two lacs of men from the country of Kling (Kalinga), with an intention of invading China. He marched by *Perak* southerly to the country of *Glangkin*, which appears to have been formerly a great kingdom on the *Johore* river, where he defeated and slew its sovereign *Raja Chulan ;* who, according to the Malayan historians, was superior to all the *Rajas* of the countries lying under the wind. This kingdom was probably that of *Zabaje*. According to Major Wilford,† " In the peninsula of Malacca, was the famous emporium of *Zába : Zábája*, in Sanscrit, would signify those of *Zába*. The empire of Zábáje was thus called probably from its metropolis *Zaba*, as well as the principal islands near it. Zába was a famous emporium even as early as the time of Ptolemy. It remained so till the time of the two Musulman travellers of Remandot, and probably much longer. It is now called *Bátu Sábor*, on the river *Johore*, which is as large as the *Euphrates*, according to these two travellers ; who add that the town of *Calabar*, on the coast of Coromandel, and ten days to the south of *Madras*, belonged to the Máhárája of *Zabaje*." The wars of this *Maharaja* with the king of *Al-Comr*, or countries near *Cape Comorin*, are mentioned by the two Musulman travellers, in the ninth century : and it seems that, at that time, the Malayan empire was in its greatest splendour. *Johore* in 1511 became the capital of a Musulman empire, but is now dwindled into a small fishing village. The chief still retains the title of sultan of *Johore*. It is in the vicinity of this place and the capital of Malacca that remains of the ancient religion, temples, sculptured inscriptions and idols, if they do exist at all, are to be looked for. Not far from the mouth of the *Johore* river, on the island of Singapore

* The present city of Bijanagar was founded in 1336 by two brothers named Aka Hurryhur and Bucca Hurryhur, on the traditional site of one still more ancient.

† As. Res. IX, page 39.

(*Singhapura*), near the point of the river, is a large stone bearing an inscription in a character which has hitherto, I believe, resisted the efforts of all decipherers, Sir Stamford Raffles among the rest.

At Malacca and the states in the interior my efforts were unavailing to procure a single inscription or sculpture, prior to Mahomedanism. My enquiries, not confined to the Malayan tribes, extended to the savage aborigines, inhabiting the wilds and forests of the peninsula, but not a vestige of Buddhism was to be traced—save their veneration for these ancestors, the partial belief of a state of future existence in the west, and the imperfect notions entertained by them of the metempsychosis.

Identity of the sacred language among the Buddhist nations of Eastern Asia. The *Káwi*, the sacred or poetical language of the Javans and Balinese, bears great affinity to the *Pali.* Most of the inscriptions found in the Buddhist temples of Java, their ancient religious works, poetical epitomes of the *Ramayana* and *Mahabharat*, are written in this language. The characters are square, many of them corresponding exactly with those of the *Pali* of Burma and Siam.* The knowledge of these ancient characters, like those of China and Japan, is confined to a few individuals. Some of the *Káwi* inscriptions, it is alleged by natives, go back as far as the beginning of the 6th century of Salivahana†, though Mr. Crawford contradicts this.

Sacred languages of the Buddhists of the Indo-Chinese kingdom. There appears to be little doubt that the sacred language of the Buddhists of *Magadha* and Ceylon, Burma and Siam, is essentially similar, though varying considerably in its written character. According to Major Wilford, *Magadha* and *Pali* or *Bali* are considered synonymous by the people of Siam, Ceylon, and Burma‡. Leyden and Kæmpfer inform us that among the Indo-Chinese nations the *Pali* is frequently denominated *Sanka-basa, Maccata-pasa* or *Magadhi-bhasa*, i. e. languages of Ceylon or *Magadha*, plainly indicating its origin. In Ceylon the terms *Magadhi* and *Pali* are both applied to it.

Sacred language of China and Japan. The sacred language of the Buddhists of China is termed the *Fan-yu*—the language of *Fan*, (India ?) where they suppose *Fuh* or *Buddha* was born. Having few books, particularly modern works on Chinese philology, to refer to, I do not know whether this language has ever been examined, or speci-

* Mr. Medhurst, when at *Sangora*, a Siamese town on the east coast of the Malay peninsula, wrote out the Japan alphabet for the Buddhist priests there, who were much struck with the great similarity existing between the characters composing it and their own. *Journal of a Voyage up the east coast of the Malay peninsula.*

† Crawford's Archipelago, vol. II. p. 213.

‡ Dissertation on the Languages and Literature of the Indo-Chinese nations, page 121.

mens of its written character given by European writers. If not, a notice of its construction, with an alphabet and vocabulary at the hands of any Chinese scholar, would be highly interesting, as well as of those of the *Bon-se*, the language and character in which the sacred writings of the Buddhists of Japan are written. It is probable they will both be found polysyllabic, and to bear great affinity to the *Pali* and *Magadha* languages of India, Ceylon and Siam, &c. Both the *Bon-se* and *Fan-yu* are unknown to the laity of China and Japan, and the written characters are said to be very dissimilar to those in common use. That of the *Fan-yu* is said by the Chinese* to have existed unchanged from the commencement of the world, as is the *Magadhi* by the Cingalese. The *Bon-se* of Japan is said to be of divine origin, and to have been first introduced from *Fiaksae*† in the west of Corea A. D. 552. The sacred books of *Buddha* were subsequently procured from India by the *Dairi-kwanum* in 805. Although the priests of China and Japan make use of these languages, in their idolatrous rites, I was assured by some Chinese officials at Malacca, that the *Fan-yu* was seldom understood even by the priests themselves, and this is probably the case with the *Bon-se* of the Japanese. The *Fan-yu* is no doubt the language in which Mr. Gutzlaff, the missionary, heard the Buddhist priests of the island of Poo-to, one of the Chusan group, chant their vespers, and which he states to have been in the *Páli* language.

Identity of Deity and Religion. The Burmese and Siamese worship *Buddha* under the names of *Gaudam* or *Gautama.* The Chinese under that of *Sheh-kea,* and the Japanese adore him under the appellation of *Saca* or *Sacya,* spelt by the Dutch *Siaca,* and by the Portuguese *Xaca.* The *Pirt* of the Siamese, the *Fuh* of the Chinese, and *Bodso* of the Japanese, are used as general terms for the deity among these nations, and are evidently corruptions of the word *Buddh* or *Buddha.*‡ The names given by the Hindu Buddhist§ *Amaracosha,* to the last supposed incarnation of *Buddha,* viz. *Sacya, Muni, Gautama,* &c. clearly identify him with the present *Sheh-kea* or *Sacya* of the Chinese and Japanese, and the *Gaudam* or *Gautama* of the Siamese, Cingalese, and Burmans. The identity of these deities is further proved by the testimony of Francis Buchanan, who saw the Chinese ambassadors worshipping the images of *Buddha,* at the capital of the Burmese empire, as if their own, and by that of a Chinese, long resident at Siam, who informed me there was but little difference in his religion, and that of the Siamese, and that they worship the same images.¶ The *Adi Saca*

* Indo-Chinese Gleaner, vol. III. p. 143. † Chinese Repository, vol. III. p. 203.

‡ For the explanation of the Chinese corruption *Fuh,* vide page 9.

§ As. Res. vol. II. page 123—4.

¶ Mr. Gutzlaff in his journal of a residence in Siam states, that he saw the Chinese make offerings to an idol of Buddha in a temple at *Kokram.*

of the Javans, who is supposed to have introduced a new form of letters and religion into Java A. D. 75, and from whose arrival on their island the Javans date their era, was probably a Buddhist priest of peculiar sanctity from India, cotemporary with *Salivahána Saca* himself, who flourished and introduced into India at this period the era of *Salivahána,* a name by which he was distinguished among the six Sacas, who give their names to the six periods, into which the *Caliyug* is divided. *Saca,* in Sanscrit, literally signifies an age or era; but, according to Wilford,* the six periods are called *sacas,* because they divide their origin from these six monarchs.

The leading doctrines of the metempsychosis, preservation of animal life, and of the *Nirvána,* or future state of rest, will be found to assimilate in these nations, and they all look forward to the advent of another and final appearance of *Buddha* upon earth. The Brahmins in a similar manner look forward to the accomplishment of the 9th and last *avatar* of *Vishnu,* viz. that of *Calci* who will appear, they say, for the destruction of all the impure with a cimeter like a blazing comet. The Buddhists of China believe *O-mi-to* (*Amida*) *Fuh* to have past, *Sheh-kea* (Sacya) *Fuh* to have last appeared, and *Me-lïh Fuh* is yet to come.

It would not suit the limits I had set to this paper to enter into a critical examination of the differences existing in the metaphysics and external religious forms and observances of the Jainas of India and the Buddhists of Ceylon, the Indo-Chinese nations and China; suffice to observe that I consider them to have originally sprung from one source, and to express my conviction that a careful consideration of the various habits—the peculiar positions, geographical and political, the prior existing religions, and subsequent influential causes operating upon these nations, will serve in a great measure to account for the present variations. In all future researches into the dogmas of these sects, the *vivâ voce* evidence of the priests should be received with great caution, and checked by constant reference and comparison with that contained in their sacred books.

Ancient inscriptions should be collected and every precaution taken to secure *Buddha* MSS. free from Brahminical taint, written in the original *Pracrit* or *Páli.* A comparative view of Brahminical and Buddha chronology is still a desideratum. The genius of a Colebrooke itself was bewildered in the chaos of 2,000,000,000,000,000 oceans of years, contained in the *Avasarpini* and *Utsarpini* divisions of time.

* As. Res. vol. IX. page 83.

II.—*On the Language, Manners, and Rites, of the* KHOONDS, *or* KHOI JATI, *of the Goomsoor Mountains; from documents furnished by* J. A. R. STEVENSON, ESQ. *Commissioner in Goomsoor, and* W. G. MAXWELL, ESQ., M. D.; *with Illustrative and connecting Observations. By* REVEREND W. TAYLOR, *Member of the Madras Literary Society, &c.*

Previous to any other observations it may be desirable to settle the true name of the people who have been designated Khoonds. In the title to Mr. Stevenson's paper on their customs they are styled కోదులు *Codulu*, and in Dr. Maxwell's list *Khoi-jati*. If the orthography of the first written term be correct, as I presume it may be so considered, it must be a mistake to write the word Khoonds, intimating a transition through the Hindustani. The Telugu alphabet has a letter corresponding with *k'h*; but as it is not used in Mr. Stevenson's paper, the proper representative according to Sir W. Jones's orthographical system is *c.*; and as Dr. Maxwell only intends to give the sound, and probably made use of Hindustani as a medium of intercourse, his spelling does not necessarily militate against the same conclusion. The people I presume to be the same with those who have been otherwise termed *Goands*, usually classed as similar with the *B'heels*. There is besides a resemblance to the native term for the Coorg mountaineers, which is *Codugu;* and I am inclined to think, that any one who fully understood the Coorg dialect, could hold intercourse with the Khoonds. The insertion of the obscure nasal sound of *n* I may observe is no objection: it may be inserted or left out, in many Telugu words, and in some Tamil ones. *Codulu* is plural in Telugu, and *Codur*, would be the same in Tamil. If from deference to the usage, which has obtained, I use the term Khoonds, it is still improperly, and from a regard only to perspicuity.

The papers by Mr. Stevenson and Dr. Maxwell, in a loose and unarranged form, may, for order's sake, be classed under two heads, as relating to the language, and to the manners and rites, of this singular people.

On the language the vocabulary transmitted by Mr. Stevenson may be first inserted; because of the precision conveyed by the use of Telugu letters. The orthography by which they are represented is not systematic; but it may suffice. I am guided by the Telugu writing.

VOCABULARY.

	Khoond pronunciation in Teloogoo character.	
God	మహాప్రభూం	Mahaprabhoe
goddess	పెంన్నూ	pennoo
earth	తాంణా	taunah

water	కక్క్రీ - శిడ్రాజీ	kakary, sedrajee
name	పాదా	pautha
fire	టాణి	taunee
tree	మ్రుహాన్ను	mrahunnoo
village	నాజు	nauzoo
villages	నాసకా	nausakah
house	యిడ్డు	iddhoo
cows	కోడింగా	codingah
goat	వొడ్డుంగా	voddungah
bullocks	బలదకొడ్డింగా	balatha koddinga
buffaloes	తల్లికోరు	tullekoroo
birds	పొట్టాంగా	pottagah
animals	జొంతు	jontoo
tiger	క్రాడీ	kraudee
fowl	కోజ్జు	cozoo
sheep	మెండా	mendah
mountain	సొరకా	sorakah
nullah or water course	జోడి	jodee
do. in plural	జోడింగా	jodingah
river	నోయా	noyee
tank	బంద్దా	bundhah
paddy-field	కెత్తా	kettah
stone	బడ్డి	buddy
herds	కొడింగా	kodingah
man	లోకో	loko

male	మ్రొణెజు	mronajoo
female	ఆసమ్రిడ్డా	ausamriddah
child	మిడ్డా	middah
mother	అయ్యాఽ	ayah
father	అబ్బా	abbah
daughter	బుడ్డి	booddee
son	మ్రీంజు - ఆపో	mrinjoo, aupoe
daughter-in-law	కుడువా - జహారి	coodoova, jahary
son-in-law	జామా	zaumah
husband		
wife	హ్రాంవి	hramauvy
birth	గాడాజోనె	gaudajonay
life	నిబ్బామానె	nibbamanay
death	సాతె	sautay
marriage	బిహా	behah
gift	బిడ్డె	bidday
male-child	ఆపో	aupoe
female-child	ఆసామిడా	ausamiddah
big	ఠరారి	tharaury
how many	యెస్సె	yessay
do you know	పుంజీ	poonjee
hallo	ఆడె	auday
head	త్లావు	tlavoo
hairs of the head	త్లావుత్లామెలకా	tlauvootlamalaka
eyes	కనకా	canakah

ears	క్రీవు	creevoo
nose	ముంగ్గలు	moongaloo
mouth	సుడ్డా	sooddah
teeth	పటకా	patakah
chin	టొడ్డాళి - సొడ్డాంగ్గా	toddaly, soddaunga
tongue	బంగోశి	bangosee
cheeks	గడ్డాగ్గా	guddauggah
moustache	శెరకోరాంగ్గా	serekoraungah
throat	డొక్కా - శెరెకి	docka, sareky
shoulder	కందా - కగ్గు	cunda, cuggoo
hand	కజ్జు - కక్కా	cuzzoo, cuckah
arm	బాహా - మొపొకుట్టా	bahah, mopokoottah
elbow	కొహొణి - గాటి	cohony; gauty
hand	మడ్డా	muddah
finger	బసకాక - వొంగరి	basakaka, vonagary
nails	నొక్కొగ్గా	nockoggah
heart	మొనొన్నొ - జెడ్డా	monno-jeddah
breast } chest }	బుఖ్ఖు	bookhoo
belly	టూటూ	tootoo
navel	పునెడ్డి	pooneddy
thigh	గొడ్డాగ్గా	goddauggah
calf of leg	సురడీ	soorady
leg	కటకా	catakah
feet	పాదాగ్గా pavoo	padaggah pavoo
back	గండీ	gundee

buttocks	గిజ్జా	ghizzah
curry	కుసా	coosah
rice	బహా - పుల్లా	baha, pullah
afterwards	బతో	batoe
before	నోయితో	noyeto
one side	పఖ్యా	puckhah
above	శెండ్డోకి	sendoky
below	నెడ్డా	neddah
distant	ధూరా	dhoorah
dew	శరి	saree
falls	తీపికమున్నే	theepekamunnay
so much	గుల్లే	goollay
paddy	కూడింగా	coodingah
rice	ప్రాంగా	praungah
paddy fields straw	పీరి	peeree
green gram, or pasaloo	మొగాగ్గా	mogaggah
Dholl or puppoo	జాయి	jayee
turmeric	శిణింగా	seningah
salt	సారు	sauroo
tamarind	నెడ్డి	neddy
chillie	ప్రితకావు	pretakavoo
ghee	ఘిహి	gheehee
oil	నిజ్జూ	nizzoo
castor oil	గబ్బాగ్గా	gubbauggah
milk	పాడ్డు	pauddoo

curds	థోయిగ్గా	dhoyeggah
wey, buttermilk	గోల్లో	golloe
fish	మినకా	menakah
flesh	వుంగ్గా	voongah
cloths	శిండ్డా	sindah
new	పూనారి	poonary
old	ప్రాడ్డారి	praddary
will you give	శియ్యామూ	seyahmoo
take	వోము	vomoo
I will give	శియాయి	seyayee
I will take	వోయిమాయి	voyemayee
do not want	శిడ్డే - కోయె	sidday, coyay
I require	లోడామంన్నె	lodamuñnay
onions	ప్యాజుకా	peyazookah
garlic	లెసుణికా	lasooneekah
unripe	శిడ్డారి	siddaree
ripe	సెనతారీ	sanataree
young fruit	కొగ్గారి	coggaree
leaf	ఆకా	aukah
a bough	డెట్టి	dettee
bud, blossoms	కోమలాకా	comalakah
wind	బలీవు	belevoo
what	యింన్నా	innah
why	యింన్నాకి	innaky
will you come	బాయింజీగినా	bayinjeegeenah

come	బామూ	baumoo
are you going	సజీగినా	sajeegeenah
go	సలామూ	salamoo
don't go	కూనాసల్లా	coonasullah
be satisfied	సత్తాషామూ	suttashamoo
be happy	మంజాదుమూ	munjadoomoo
you will be ruined	బాసంగాడి	bausungaudy
it will be good for you	నెగ్గారాడి	neggaraudy
don't fear	అజ్జాఆ	azza-ah
weeping	డ్రీమంన్నె	dreemunnay
laughing	కక్కానారీ	cuckanary
talk	కత్తాచెస్తాము	cuttachastamoo
eat	తినుమూ	tenoomoo
drink	వునుము	voonoomoo
good	నెగ్గారి	neggaree
not good	వొదాయితారి	vodauyetaury
ask	జామూ	jaumoo
tell	బెసుమా	basoomah
I will tell	బెశిపింజాయి	baseepinjayee
do you understand	పుశి	poosee
I understand	పుశె	poosay
collect in one place	రోబాతా	robatah
friend	తోణె	tonay
	Mitto	mitto
dark	అడ్డాంగ్గి	addaunghy

light	వుజ్జాడి	voozzady
break of day	బెళాతా	balatah
night	నాడాంగ్గి	nadanghee
sun	బెళా	balah
moon	దాంజు	daunjoo
stars	సుక్కాంగ్గా	soockaggah
morning	నాడి	naudee
midday	బెండా	bendah
evening	బిల్లాడి	billadee
tomorrow	బిఱె	beyay
day after tomorrow	మాయిశి	mauyesy
yesterday	రిఱెశి	reyasy
day	నెంజు	nenzoo
month	ఆంజ్జో	aunjo
year	బొరసకా	borasakah
raining season	పిజ్జుదినా	pizzoodenah
cold season	పెన్నదినా	pennadenah
hot season	కరాదినా	caradenah
plural	డెహా	dahah
singular	రోండ్డె	ronday
wax	శిత్తా	sittah
honey	ఫుక్కి	phoocky
maiming	కత్తనా	cattanah
fly	బీసా	beesah
one	రోండ్డె	ronday

twenty	కోడకాత్తూ	codacauttoo
hundred	సోయకా	soyakah
two hundred	రీసో	Reeso
thousand	అజారకా	Azarakah
two thousand	రీఅజారా	ree azarah
small	కోగారి	cogaury

The first word is Sanscrit, with a dialectic termination. It means *great chief, prince,* or *lord,* from *mahat* great and *prab'hu* a lord, &c. and is so used in, I believe, all the dialects of Southern India. The second word is Tamil simply for a *woman* or *female,* in ordinary acceptation. The word for earth, is one designating place or locality ; and, derived from Sanscrit (if not adopted by it), runs through most of the Hindu languages, with dialectic variations. The word for fire, corresponds nearly with the Tamil தணல் *tanal,* great heat. The word for tree at first embarrassed me ; but it is evidently only a dialectic variation of the Tamil மரம் *maram,* a tree. The word for village is the Tamil நாடு *nádu,* properly country as distinguished from town, sometimes denoting a district, and in use nearly synonimous with village : the difference of *du* and *zu,* is merely dialectic. The plural form *kah,* besides differing little from the Tamil plural, *kal,* is further a close resemblance to the mode in which the plural is enunciated in the extreme south. The word for house varies very little from the Tamil வீடு *védu,* denoting the same thing. The word for cow has in it the Sanscrit root *go,* or *gau.* The term for goat is like the Telugu వేంట *venta,* a sheep or goat : it must I think be the same word. The word for birds, cutting off the plural termination, is the Telugu పెట్ట *petta* a bird. The next word for animal, is Sanscrit, Telugu, and Tamil, common I believe throughout India. For fowl the word is the Tamil, கோழி *corzi,* the Telugu letters expressing an imitation of the Tamil sound : the retaining this Tamil peculiarity is favourable to an inference as to the Tamil origin of the Khoonds. Mendah* for sheep is an intermediate sound between the Telugu వేంట *vénta,* and the Tamil மந்தை *mantai,* the former signifying a *sheep,* the latter more properly a *flock.* The word for mountain, is, setting aside the *kah,* apparently the Tamil சுரும்பு *surumpu,* or

* The *h* in this, or in the other words is not in the Telugu characters but simply long *á* as found in the word *after.*

of kindred origin. The term for river would seem to be only a dialectic variation of the Tamil நதி *nathi*, (*vulgó* nuddee, and nullah) a word which, coming from the Sanscrit, is found in all Hindu languages. The words for tank, stone, man, seem to come from the Hindustani, or possibly from the *Udiya* language of the province of Orissa. The word for mother is a slight variation from a Tamil word of like meaning, though now not much used. *Abba*, for father is found in Hebrew, Syriac, Telugu, Tamil, and in some of the dialects of the islands in the eastern archipelago ; and is perhaps one of the most remarkable of all words. *Booddee* for daughter is the Sanscrit *putri*, slightly corrupted. *Aupoe* for son, is perhaps none other than the familiar domestic term of endearment அப்பாவு *appavu*, only used in addressing a male-child. కుడువ *coodoova* is the Telugu word కోడలు *codalu*, a daughter-in-law. The word for son-in-law seems merely a corruption of the Sanscrit *jamalu*, having the same meaning. *Behah* is also a mere dialectic variation from the Sanscrit *vivaha* marriage. The word for male-child is the same as the above for son, and the word for female-child may be a corruption of the Sanscrit *átmajà*, a daughter. *Yessay* for how many, is, I think, originally the same with the Tamil எத்தனை *yettani*, of the same meaning; த் and ச் or t and s, are frequently interchangeable in Tamil as in பெரிது, பெரிச great, பழுது, பழச old, சிறுது, சிறுச small, in which case *s* is the more rude, and *t* the more refined. *Tlavoo*, seems also to be originally the same word with the Tamil word தலை *tali* head. The word for eyes is Tamil, with a slight difference in the plural termination, as before noticed. The word for ear in Sanscrit is *srava*, in Telugu, *sevata*, in Tamil *sevi*, in the Todar dialect of the Neilgherries *kevi*, in the Khoond dialect, *crivu*, in Tamil the word *hearing* is கேள்வி *kelvi*, shewing that *s* is changeable into k, as is indeed the case with some other words. The natural conclusion is, that the whole of these words are dialectic variations from the Sanscrit *srava*, or conversely that the Sanscrit word was adopted from a common root; but I would not assert either conclusion. The word for nose is in Tamil மூக்கு *múccu*, or Telugu ముక్కు *muccu*. For teeth the Tamil word is பற்கள் *parcal*, differing very little from the Khoond word. The Todars of the Neilgherries I am informed use the sound பர்ச் *parch*, for tooth. The word for throat, *docka*, is used in Tamil to signify any hollow of a tube or pipe. The first of the two words for shoulder is the Sanscrit *scand'ha* having the

same meaning; and in Tamil, words from the Sanscrit, with the initial letters *sc*, usually lose the *s*, by which process the word would become *cand'ha*, or *canda*, as in the Khoond dialect. The word for hand seems to come from the very old Tamil *kayi* கய், the modern spelling being கை *kai*. The ய் by no unusual process is changed into சசு *chu*, whence the Khoond word *cuzzoo*, or as I should spell it *cajju*. The word *bahah*, is Sanscrit *báhu* the arm. The word for nails differs only slightly in its plural form (as before) from the Tamil நகங்கள் *nacangal*, of the same meaning. The two words for heart, are, I doubt not, the same with மனம் and சித்தம் *manam*, and *sittam*, usually denoting the *mind* and *will*, but used interchangeably with இருதயம் *irutayam*, *heart*, in the sense of will or inclination. *Padaggah* is only the Khoond plural added to the Sanscrit *pata* and Tamil பாதம் *patam*, a foot. *Gundee* for the back is I believe the Tamil குண்டி *gundi*, the lower part of the back. The word for afterwards is probably Hindustani. The word for distant comes from the Sanscrit, and is common to all *Hindu* languages. In Tamil பிரி *piri*, and புரி *puri*, are used for a straw rope, and I doubt not that the same is meant by the Khoond, *peeree*. *Sauroo* for salt, is from the Sanscrit, *cshara*. In Tamil the word is usually combined with the common word for salt, to express the flavor or relish of salt. The word for chillie, differs only very slightly from the Telugu word for the same. *Nizzoo* is only the Tamil word நெய் *neyi*, the ய changed (as before) into *chu*, making *nejju*; but this in Tamil signifies ghee, or butter-oil. The word for fish, cutting off the Khoond plural, is the Sanscrit *mín* and Tamil மீன் *mín*. *Poonary* for *new*, seems to be an antique word, preserved here and in the Tamil புனிறு *punirru*, the Tamil word being now only applied to the new birth from a cow. The word for old may have a connexion with the Tamil, but the resemblance is obscure. The word for garlic is Sanscrit, *lasuna*. *Aukah* for leaf is Telugu, ఆకు *acu*. The word for bud, blossoms, rejecting the Khoond plural, is Tamil குமிலி *cumili*, a bud. *Innah* for *what*, is the Tamil என்ன *yenna*, what? *Innaky*, for *why* is seemingly the Tamil என்னத்துக்கு *yennattuku* to what, why? In the phrase for *will you come?* the root of the verb *to come*, and the interrogating particle are both Tamil: the Tamil root is also found in the Khoond word *baumoo*, *come*. Salamoo, cutting off the Khoond termination, is

Sanscrit *sala*, to move, to go, it is corrupted both into Hindustani and Tamil. The word for don't fear seems to bear a relation to the Tamil அஞ்சாதே *anjaté.* The word for laughing is preserved in the Tamil phrase கக்கக்கென்று சிரிக்கிறன் he laughs uttering *cacac*, in the Telugu కక్కునవ్వు *cacacnavu*, is a rude, or horse laugh; and a resemblance is also found in our common English, to *chuckle.* The phrase for talk is half Hindustani, half Telugu. *Tenoomoo* for *eat*, in the Tamil தின்னு *tinnu*, with the Khoond termination. *Voonoomoo* in like manner is the Tamil உண்ணு *unnu*, *eat* or *drink.* The word for tell is Telugu. *Tonay* for friend, is the Tamil துணை *tunai*, a friend, a prop. The other word is Sanscrit *mitra*,* a friend, it is adopted into Tamil, but most usually to signify treacherous friendship. The words for light, and break of day, have only an obscure resemblance to Tamil words of like meaning. For *night*, the word resembles the Tamil நத்தம் *nattam*, *night.* The word for stars rejecting the Khoond plural is Telugu సుక్కు *succu* a star. The word for morning seems the same as the Telugu, నాడు *nadu* a day. *Borasaka*, for *year*, or, as I suppose, for *years* is no doubt, the Tamil வருஷம் *varusham*, a year. The three following words, for *hot*, *cold*, and *rainy season* seem to come from the Hindustani: the same remark applies to the word for *maiming.* The word for *hundred* seems to be a corruption of the Sanscrit word, that for *thousand* is I think the same as the Tamil ஆயிரம் *ayiram*, and for *two thousand*, a sort of bad pronunciation of the Tamil இராயிரம் *irayiram*, two thousand.

Such is the result of an investigation of the list of words, transmitted by Mr. Stevenson, expressly made the more minute, because both of the precision and check afforded by being written in Telugu characters: without these I should not have been able to give the words their proper enunciation, as the English orthography is not systematic and therefore uncertain. It must, however, be remembered that even the Telugu only gives the sound as conveyed to the ears of a comparative foreigner; though more likely to catch the true sound than an English ear. I suppose the mountaineers in question to have no written language.

From what has been stated, conclusions might be ventured; but it may be best to bring in further examples. The vocabulary of Dr. Maxwell has a somewhat larger number of words and phrases. It was accompanied by the following letter:

* It would have been desirable to give the Sanscrit in the original *Dévanágari* characters, in the same way as the Tamil and Telugu characters are given. They were written in the copy; but omitted, I presume, through a want of that kind of type.
W. T.

To The Secretary to the Madras Literary Society.

&c. &c. &c.

Sir,—Any thing connected with the history of the tribes above the Goomsoor ranges of mountains, being interesting at the present moment, I beg to send you a list of Khond (or Ghond) words, which I collected whilst up there.

The Wodiah, I have also put down, which will render the list more interesting, and enable those, better qualified than myself, to make useful comparisons. To those passing through Wodiana into Khondistan this little list may also be of some service. I have only to regret that I cannot send you a more extended one.

I have the honor to be,

Sir,

Your obedient servant,

Samulcottah, *March* 15, 1837. W. G. Maxwell, m. d.

The Vocabulary is the following one :—

English.	*Woadiah.*	*Khond.*
one	ekke	ekke
two	doue	doue
three	tine	tine
four	chare	chare
five	panch	panchu
six	chau	sau
seven	sat	sathu
eight	ath	athu
nine	nau	nau
ten.	dos	dosu
eleven	egarah	egara
twelve	barah	baarah
thirteen	terah	terah
fourteen	chaudah	saudah
fifteen	pundarah	pundarah
sixteen	solah	solah
seventeen	satarah	sataarah
eighteen	atarah	ataarah
nineteen	unis	unisi
twenty	kody	koze
a man	manusha	jama
woman	maikinya	asamida
boy	pua	apo
girl	ghia	bude
father	boppa	aba

mother	ma	aya
grandfather	bodda boppa	akenja
grandmother	bodda ma	atha
grandfather, mother's side	wodja	akey
elder brother	nunna	dada
younger brother	sana bhai	apo
elder sister	nanni	bhai
younger sister	bhouni	budi
what is your name ?	tuora naum kiso	anni padatatti inu
where is your village ?	toura gau koture utchi	mi naju embam unni
come early in the morning	boddu soccale aso	daasay vam *or* bam
how far is your village ?	tuora gau kete door utchee	mi naju esse duro
my village is ten coss	humara gau dos kos utchee	mai naju dos kossu ane
how far is Patlingeah ?	Patlinga kete dur utchi	Patlingaki essse dur ane
have you cooked food ?	bhatta randuloki	veyha vasiti ginnaa
have you eat food ?	bhatta khailoki	veyha tisi ginnaa
how many seers of rice did you eat ?	kete ser chaulo bhatto khailo	pranga esse adiah tinge
I eat three seers of rice	tin ser chaulo bhatto khailu	tin adiah veyha tiee
do you eat meat ?	Maunsa khailoki	inu onga tinji ginnaa
what meat will you eat ?	tu ki maunsa khaibo	ani onga tinji
I will eat mutton	cheli maunsa khaibu	odu onga anu tiee
I will eat fowl	kukuda maunsa khaibu	kodju ongha tiee
I will eat fish	matcho khaibu	minu anu tiee
I will eat dry fish	sukwa matcho khaibu	nore minu tiee
I will eat pig's flesh	gusri maunsa khaibu	anu paji onga tiee
who is your God ?	tumara kau Deybota	mindi anni peynu
what is his name ?	tumara Deybota namo kiso	mi peynu anni peynu
how many gods have you ?	tumara kete Deybota utchi	mi peynu esse peynu munne
Takurani is the greatest of all	samos teko bodda takurani	gulletiki dumalurri durani
how do you pray to the God ?	ki mante Deybota puja korocho	peynuki singhi lakīderu
what is the name of this month ?	ye masuro namo kiso	iree anni danju
February	Mhago	Keydu
how many people do you sacrifice in one month ?	gute masure kete manuso katuso	oro danju esso anni mirimmi pakidirru
amongst the khonds how many castes ?	khondare kete jati utchi	khȯi jati esse jati munney

maliks	maliko	maliko
toddy dealers		sundee
cattle dealers		gouro
smiths		shouro
potters		comboro
basket-makers		dambo
weavers		panu
do you kill the women in your country?	tumara gau re maikina ko mari pakawucha	mi naju tarrani as-amidani pakadir-ganaa
yes they kill any person they can get	je milibo lukku mara-chu	esso anni paneru e anni paginirru
before killing how long are they kept?	kariba agere ketedin rakucho	paginne veline esso dinno raigadirru
no time is fixed	ko dinno tikkana nein	denno tikna ate
in this month they sacrifice	ye masure sonki katu-cho	edanju marimmi pa-ginirru
fire	nia	nari
ashes	karo	nari niju
charcoal	ongharo	1. nari sirovi 2. ongaranga
jungle	bono	gossa
tree	gotza	mhranu
chatty		tikki
dammer		saddali
fan	bichana	bichane
sun	korra	karra
moon	junno	danju
star	torra	sukkanga
cloud	megho	mudeng
rain	barrosa	piju
word, speech	kotha	katta
head	munda	tulao
nose	nakko	mungeli
mouth	sudda	suddo
lip upper		todde
lip lower		rapaddi
teeth	dant	patka
hair	bala	tala merka
breast	bukko	dukhi
belly	pettau	tutu
hand	katau	kadju
finger	angoti	vanju
nail	nakkau	ongoli
thumb	bodda angoti	darra vanju
foot	gaddu	kadu guttasi

knee	anthu	menda
leg	panda	pottu
eye	ankhi	kannu
ear	kanno	kirru
tongue	jibbo	wangosy
earth	matti	virra
stone	patro	vaddi
water	pani	1. sideru 2. sideruji
milk	palu	padu
salt	nuno	saru
leather	chummo	(gooroo) panda
battle-axe	tangi	tangi
cloth	lugga	sinda
brass-goglet		pida muta
marking-nut		gonje
gooseberry	aumla	zarga kanga
saber bean	chary gotza (tree)	pa erri (fruit)
horse	ghorra	ghora
leaf	puttera	akka
(mountain) indigo		vareda
beans of		vareÿda guzerka
flowers of		vareyda poongha
I eat the flowers of M. I.		vareda poongha tinum
tree (bark of)		terasu mhranu
burra gotza	bodda gotza	darri mhranu
burra dez	bodda dez	muta khonda
what language do you speak ?	ki kotha koucho	anni katta vespimanjari
dubash	dobashi	dubassa
what business is the dubash's ?	dobashi ki, ki peyti wutchi	dubassa anni kabbari giajinaru
who went there now ?	yebbe kese golla ci battere	i pari imbai sajjumunni
what did you do with the cloth ?	ce lugga kaunokollo	e sinda anna gitti
I gave it to my wife to put on	humaro bhajoki pindibako dellu	mai kura nagulaimunni site tatite
give a seer of rice to that man	ce manusho ko sere chaulo de	e manaheniki pranga ade ka site
give a seer of rice to that woman	ce maikana ko sere chaula de	e asamida ade ka pranga sidu
give a seer of toor to that horse	ce ghorra ko sere khandulo de	e ghoratiki khanga ade ka sidoo

how many wives do the khonds take?	khond jattire gutte jonon ke lutta vivaha utchi	koi jattiki esso unni vengha teru
do you smoke tobacco?	tu dhua khao chuki	inu dhua undiginaa
do you eat tobacco?	tu dhua tondere pakka utchi ki	inu dhua tinjiginaa
bring fire	nia ano	1. tammare nari 2. nari tummu
bring food	bhatta ano	tammare veyha
bring paddy	dhanno ano	tammare kodinga
bring rice	chaulo ano	pranga tammu
take away the fire	nia ne	nari om
take away the rice	bhatto ne	veyha om
take away the paddy	dhanno ne	kodinga om
father take away the paddy		kodinga ommare aba
bring the horse	ghorra ano	ghora tammu
bring the goat	cheli ano	oda tammu
kill the goat	cheli maru pukka	oda kattam
a kid	cheli pilla	oda mida
bring the cow	gai ano	koudi tammu
bring the calf	damri ano	dradu tammu
house	ghorre	iddu
is there any fire in your house?	tumara ghorre bihtere nia watchiki	mi idduta nari munneginnaa
is there water in your house?	tumara ghorre bihtere pani watchiki	mi idduta sideruji munneginnaa
how many people in your house?	tumara ghorre kete jonon watchinti	mi idduta esse loku maneru
who cuts the wood to build the houses?	ghorre bandibako katho ke dowatchi	iddu gariki vattiki vesca imbasianne
all the villagers cut	sub gaun lokko katti annile	gulle najutakka vesca kattinerru
what wood is that plank?	ce potta ki kotha	erri anne vesgu patta
mangoe	ambo katho	mha vesca patta
how many planks are got from one large mangoe tree?	gutte ambo gotzeru kete potta barivo	erande mhranu essoni putta anu
two	Jure	joreka
terminalia bellerica fruit of		bare khanga
leaves of		bare aka
tree		bare mhranu
kernel		bare monzo
stone		bare palla
people eat the dry kernel		monzo gulla takka tinum
burra sahib		darre saib

maharaja		maparu maharaja raju
queen		mhade
toddy tree	sollupu gotza	sorta mhranu
comb	kangai or punya	sireni
go to that village and call a man	ce gaun ko jaikare gotte monushu ko dakiano	e naju sajane arkamu manheni erru anni arkam
will you go to Berhampore?	tu Berhamporko jiboki	inu Berhamporko sajiginaa
I will go	mu jibi	ana sagimai
I will come to-morrow morning	succalu asibi	daase vai
grass	ghasso	solah
long grass	nhoda	judah solah
basket	takkei	bogah
dammer tree	loringhi gotza	zirgi mhranu
dammer flowers		zirgi poongha
red	lall	inghu
black	kolla	kali
white	dhoba	longi
yellow	holidia	siningha
chair	kursi	(nō name)
bow	kando banso	viddu
kheli bow		kheli viddu
bamboo-bow		mari viddu
bow-string	gunno	viddu vessa
arrow	sorro	miliu
point		gouri mouari
barb	sorro charo	gouri kora
binding	loi	goha
notch	gunno jugga	tauni
feather	phonkhi	katka
quill	phonkhi	kedu
I am coming	mu asowatchi	anu idde vai
I am going	mu jaowatchi	anu sajimai
he is going	ce jaowatchi	yanjhu sajimunni
he is coming	ce asowatchi	yanjhu vai munni
we are coming	hum asowatchu	amu vanam
you are coming	tum asowatchu	eru vadu
they are coming	ye asowatchi	vaimanenju
I will go	mu jibi	anu sagimai
he will go	ce jibu	yanjhu sajimunni
we will go	hamen jibbu	amu sagimunnum
spirits	modda	kallu

they make toddy from the *Erpatree* flowers, &c.*	moulo gotzere teiaro koriba modda	erpi phoungha mhranuta kallu teiari gia manju
they put (the flowers and fruit ground small) into water for four or five days—and then boil—and then take off the spirit	(phullo phallo) chari panchi dini panire bottere rukhibo tein potche randibo tein potche moddo karibo	char panch din sideruji itininju dau vajininni dau kallu eheneju
what is the use of the kissi tree ?	kissi gotza ki peyti ki asowathci	kissi mhranu anni veygierru
we use the bark to make strings	lohi douri pain noutchu	amu nossu doruki vattiki onum†

After making out the list of words and questions, I took every opportunity of interrogating any Khond whom I met, and it was amusing to see his astonishment when I spoke to him.

On returning to the low country the only Khonds I met with, were some young children that had been preserved from sacrifice by the Collector. To one of these I addressed myself, asking his name in Khonds ; speaking fast, at first he did not understand me, but on pronouncing more slowly and distinctly, he instantly called out his name.

In the preceding vocabulary the numerals are derived from the Sanscrit: the Tamil numerals are quite different. Some few of the words have been explained in Mr. Stevenson's list. In the rest there is a tolerable sprinkling of words, which are synonimous with Telugu or Tamil words. The *Udiya* dialect is seen at a glance, to be derived from the *Mágadha*, or Bengal and Bahar dialects, if not from the Hindustani, to which it has a frequent resemblance, sometimes amounting to identity. But I look upon the *Udiya* (or Wodiah) to be more modern than the Khoond speech. The word for milk may be noted as being in Udiya, the same as in Telugu, and nearly the same as in Tamil, while *Pádú*, as the Khoonds have it, shews a variation, which would give a different sense in Tamil ; and yet it is probable that the word in all three dialects is originally the same. It will not perhaps be expected, and I know not that it would answer any really valuable object, to pursue as minute an examination with this list as with that of Mr. Stevenson. It may suffice to say that the same general result is indicated ; which is, that the Khoonds have words peculiar to themselves, and others which are found in the low-land languages of the peninsula.

* *Bassia longifolia.*

† The diacritical vowel-marks employed by Dr. Maxwell are omitted in the printing, and by consequence his glossary of them ; probably from the want of types with such marks. This explanation is given that Dr. M. may not consider his directions to be neglected. W. T

Before proceeding I must premise, for the information of some readers, that it has been a question among learned Orientalists, whether the refined Sanscrit was the parent of the common Hindi, the latter being a corruption, or whether the Hindi formed the basis or substratum of a common Indian language, adopted by the *Brahmans* on their entry into Hindustan, but polished by improvements and enriched by the addition of scientific and other terms, especially astrological ones, brought with them on their emigration. Perhaps from acquired partiality to the Sanscrit, there has been, with scholars in that language, a tendency to adopt the first supposition, just as there was with the same individuals a disposition to consider Telugu and Tamil as derived languages from the Sanscrit. But the erroneous character of this last deduction, reflects a doubt on the other part of the supposition as regards the *Hindi*; and I confess that when reading Mr. Colebrooke, in particular, the proof which he brought to bear in favour of Sanscrit being the original, and *Hindi* the derivative, produced in my own mind a strong doubt on that side of the question; while his admission of existing difficulties as insuperable on that hypothesis seemed to me to argue in favour of *Hindi* being the parent, and Sanscrit the polished, improved, and enriched, derivative. The very meaning of the term Sanscrit, implying *finished, polished, perfected,* argues towards the same conclusion. Even so our present polished English language, must be considered as founded on the Saxon; it would be absurd for any foreigner to term the old Saxon an early corruption of the original polished English. That view of the case which considers the Sanscrit to be a learned refinement on ruder dialects, if correct, leads to connection with another opinion, one that is likely to have strengthening evidence constantly added to it, which is, that there was one original *substratum* of an early and rude language, running through the whole of *Hindustan* and the peninsula; broken by time and distance into local dialects, which however still retain a strong affinity with each other. Such being supposed to be the case, is the Khoond dialect a relic of that common language, somewhat modified by time? or has it been made up by intercourse with people speaking the different languages, that have been discovered to exist, as if naturalised in the Khoond dialect? I am not able to determine either way; but, with some allowance for the latter source, in some cases, I incline rather towards the former view of the subject. I have read in some publication, concerning the Khoonds, that they have among them a tradition of having emigrated from the south, and from some mountain termed by them *Dodah.* This was the cause of my conjecturing some connexion with the mountaineers of the Neilgherries, whose highest mountain is *Dodabet,* and whose chief people

are the *Todars.* The comparison* of language however, so far as I have been able to effect it, has not much assisted any such conclusion. The Khoonds have words which are of antique, pure, and high Tamil ; such words are favourable to an ancient origin of their tongue. If at an early period they were driven to take refuge in mountain-fastnesses, by reason of nomadic hordes of foreigners taking possession of the low-lands, then they might very probably carry with them the ancient general dialect of the low country. I have some reasons for such an opinion, founded on documents not yet before the public ; but the most I can here do is to throw out the question for further consideration and investigation.

The second topic of attention is the manners, and rites, of this singular people. A brief extract from Mr. Stevenson's letter to the Editor of this Journal may perhaps best introduce this part of the subject.

" I must quite give up all hopes of being able to compile anything connected with the Khonds, &c. I have in vain attempted to find time to translate the enclosed memorandum, which are answers to queries put from time to time by me: you will have no difficulty in getting them translated,and if worth anything they can be made use of— the small *Vocabulary* is, I think correct—the account of the Merria or human sacrifice is also correct—but this I gave to Mr. Russell with a request that if he did not wish to incorporate it in his Report he would send it to you. If you think it worth while you might procure his consent to publishing it---to which, as he has finished his report, he would not probably object. The form of oath in their own language is curious and striking—these notes may assist you, or others who have collected materials, in drawing up a short memoir."

The memorandum to which Mr. Stevenson alludes, is a Telugu paper, rather in a Cutcherry hand-writing. It illustrates some of the curious peculiarities of the Khoonds. I have made with some care, and here present the following

(TRANSLATION).

The customs of the race of people called Codulu.

1. *The mode of celebrating marriages.*—Some of the relatives of

* After the above had been forwarded to the Editor of this Journal, that gentleman was so kind as to send me the first part of a Vocabulary by Reverend B. Schmid of the language of the Todars and Burghers (or rather *Vadagars*) of the Neilgherries. The perusal did not add much to resemblances of the Khoond dialect, but the materials on either hand are not full. The Todar language has some few Tamil roots, the Burgher dialect is full of Tamil words. The Todar dialect indicates great antiquity, and derivation, I am almost positive, from the Canarese, probably Hala Kanada.—The speech of the Vadagars (or northerns ?) is much more modern—that word at Madras designates the people of Telingana ; but being merely a relative term, it may have been used to designate a people who emigrated from some district, or country, north only of the Neilgherries. W. T.

the intended bridegroom, go to the house of the future bride, and ask if it be agreeable to give their daughter in marriage to the person indicated. If agreeable to the latter persons, they signify their consent; and they give a she-buffalo to the persons who came to make the demand. On the road back, they kill this animal, slightly roast it, and eat it. The following day the people of the intended bride's family go to see the purposed bridegroom: on which occasion the relatives of the latter shew every thing contained in their dwelling, or possession, to the visitors. Whatsoever these find to be valuable, be it a cow, or any thing else, they desire that it may be given to them; and they receive a promise that it shall be given, though it is not allowable then to receive and take it away: they feast on ardent spirits and flesh, and then depart. The next day the relatives of the man, call together a few other people; and the whole proceed, carrying the cow, and other things, to be given as requested. The people of the woman's family kill a number of buffaloes, proportioned to the visitors; on half the flesh of which the whole feast together, while the other half is carried back by the visitors, and made to feast all their relatives. Another time, the man's relatives proceed to the other house, and give them a formal invitation. On the female's relatives going accordingly, the people of the man's house kill buffaloes, eating one half together, and giving the other half, with rice, to the visitors, who carry the same back, and with it feast their relations.

Subsequently, the mother and father of the man, go to the other house, and ask when it will be agreeable to the female's relatives, that they should come to escort the female; and when any day whatsoever* is fixed upon, the precise place where the parties are to meet is specified. At this visit free use is made of spirits and flesh, before the visitors depart.

On the appointed day, mats† are laid down for the bride to walk over, and spreading a mat over her for the sake of shade, they give to her all needful household stuff, or utensils; and, accompanied by a crowd of men and women, they go a short distance in procession to the place previously indicated. The mother, father, and relatives of the man, remain previously a little farther off. The people of the female convoy, call out to the others to come and fetch the bride; and then a mock fight, with stones and thorny brambles, is begun by the female convoy against the parties composing the other one. In the midst of

* A negligence of auspicious, or inauspicious, days (according to *Hindu* notions) is implied by the Hindu writer of the original paper.

† The Hindus have a similar custom at their *funerals*, only they spread cloths instead of mats.

the beating, the assaulted party take possession of the bride, and all the furniture brought with her; and carry all off together. The female's relatives return from that place to their dwelling. The day following this transaction the man's relatives locate the female, and the furniture brought with her in the inner open court of their house. Subsequently placing her on a stool, they pour water over her head in bathing. Beneath this stool, the younger sisters or younger brothers of the bridegroom are concealed; and the water flows down over them. They take occasion, during the bathing, to snatch off the ring, from the bridegroom's finger. On her asking to receive back her ring, they strip off from one of themselves some valuable ornament, and give it to her, retaining the ring. Soon after, their hierophant (*Jáni*) comes bringing with him a cord,* a turmeric rod, also a nut of the tree *mesua ferrea*, which he strings upon the cord, and taking these things together with the bride and bridegroom only, he goes into the woods, where a hut, made only of sticks has been before prepared, in which being seated, the *Jáni* wishes them both health and domestic prosperity, and ties the cords* on the neck of each one. Afterwards they return to the house. Hogs and other animals are killed, and liquors brought, when they prepare *báji* (supposed from the use of the word in another place to be a sort of olio, or mixed dish) and all partake of it. From this day forward, the parties are considered to be man and wife. They beat on drums; they give to the *Jáni*, rice, flesh, and liquor, and send him away.

2. *The ceremonies attendant on the birth of a child.*—As soon as a child is born, they follow the ancient custom (not explained). For a month after the birth the mother does not eat out of the household vessels. On the day which completes the month, they kill some animal, and prepare the flesh, they also procure liquor, and make *bàji*. The victuals is cooked by the mother of the child. They pour a small quantity of liquor out upon the ground (as a libation) saying, " O beneficent goddess! preserve the child." They then distribute portions of prepared food and *curries* to the houses of their various relations. Those immediately belonging to the house, consume as much liquor as they please, and make *báji;* (here the word seems to denote a riotous banquet, or a feast).

Six months after, on a fixed day, they make *Gáduthuvà* (supposed to mean the same as *Námacarma*, or ceremony of naming the child). On that day killing a hog, and procuring liquor, they make *báji*. They wash the feet of the child. The *Jáni* being come, he ties a cord from the haft to the point of a sickle; they divine by means of it. Having

* The original is followed; the composition of which is not very exact in the use of singular and plural.

assembled the *Petrilu* (literally ancestors, but here denoting household images, or gods) they put rice on the sickle. As the names (of the ancestors? or family?) are repeated in order, each time the rice is put on, that name is chosen on the mention of which the sickle moves, and is given to the child. They then drink liquors, and eat *báji.* They give rice and flesh to the *Jáni.*

When two years are elapsed, they cut off the child's hair, and on that occasion, killing some animal, and procuring liquor, they make *báji.*

3. *The ceremonies customary at funerals.*—On the life ceasing, they tie a sheep to the foot of the corpse. They carry the clothes, brass eating-dish, brass drinking-vessel, ornaments, grain in store, and the said sheep, all together to the burning-ground. Having burned the body, and gone round about the pile, they leave all those things there, and beating drums, return home. Those garments the *Pánó** take away. They procure liquor, and drink it. They then go to their respective houses and eat. On the next day, they kill a she-buffalo, and get together a great quantity of liquor. The whole of the tribe (near and distant relations) being assembled, they make *baji*, and eat: they beat the drum (or drums). If the deceased were of any consequence, dancers come, and dance to the sound of their drums; to whom some animal is given, which they take and go away. Subsequently on the twelfth-day, they carry a hog to the spot where the body was burned; and after perambulating the site of the pyre, return to their home; where they kill the hog in the place set apart for their household gods; and procuring liquor, they make *báji*; the members of the tribe eating together.

4. *Case of death by a tiger.*—Should a tiger carry off any one, they throw out of doors all the (preserved) flesh belonging to him, and all the people of the village, not excepting children, quit their homes. The *Jáni* being come, with two rods of the *tummèca* tree (*Tamil—Véla maram*) he plants these in the earth; and then bringing one rod of the *Conda-támara* tree, he places it transversely across the other two. The *Jáni*, performing some incantation, sprinkles water on them. Beginning with the children, as these and the people pass through the passage so formed, the *Jáni* sprinkles water on them all. Afterwards the whole of them go to their houses, without looking behind them.

5. (*Degraded occupations*).—The *Mangili* (barber) *Pánò, Hadi, Dandási,* these castes, being excepted, the *Codulu* people eat with all the other tribes.

6. (*Treatment of Brahmans*).—The *Codulu* people do not pardon the *Brahmans* (or show them favour beyond others).

* Weavers.—Dr. Maxwell's vocabulary.

7. *The castes* (or tribes) *of the Mountaineers.*

1.	Codulu	7.	Gaudd'ha	13.	Cheduvà
2.	Páno	8.	Cumari (potters)	14.	Vódià
3.	Hadi	9.	Sudbà	15.	B'hadálà
4.	Chittra	10.	Gaudu	16.	Béniyà
5.	Lóhárá	11.	Tòmla	17.	Vómayattá
6.	Gunnà	12.	C'hadbà	18.	Sodi.

These tribes are in the mountains.

8. *The gods honoured by the Codulu people.*—1. Dherma dévata. 2. Savuri-pennuga, a forest-goddess. 3. Jácari-pennuga, a local goddess. 4. Járápennu, so called a *Linga dévata,* which is their favorite deity. 5. Jurachi-pennuga, the god or goddess of rain. 6. Tada-pennuga, the earth-goddess.

9. *The manner of worshipping these deities:* 1. If occasion arise to present any offering to *Dherma-devata,* they take inferior rice and mingling turmeric with it, they hold it up, and worship.

2. To *Savuri-pennuga,* the so-called forest deity, when the corn flourishes, they bring liquor, fowls, rice, and roasting the fowl, they cause worship (*puja*) to be made by the *Jani,* and preparing *báji* they eat.

3. To represent *Jacari-pennuga,* the local deity, they fix three or four stones, and near to these (representatives) they place dressed dolls, artificial figures of birds on sticks. On the beginning of any thing, or affair, or any particular occasion, they call for the *Jani* and slaying fowls and hogs, they bring liquor and making *baji,* eat.

4. To represent *Jara-pennu,* the *Linga-daveta* or the *Petri-devata,* they make, in brass, figures of elephants, peacocks, dolls, fishes, these and the like, and keep them in their houses. If affliction happen to any one belonging to the household, or if the country cutaneous eruptions break out on any of them, or if the anniversary of an ancestor's death occur, they put rice into milk, and mingling turmeric with it, they sprinkle the mixture on those images, and killing fowls and sheep, they cause worship to be made by the *Jani*; and, making *baji,* eat.

5. For *Jurachi-pennu* the rain-deity, if there be no rain, they kill a sheep beneath a tree, and causing worship (*puja*) to be made by the *Jani,* they cook half the flesh for the *Jani,* and cause him to eat, and the other half they divide among themselves.

6. To *Tádá,* the *B'hu-devata,* or deity of the earth, they make the *merria*-sacrifice, or offering. This *puja* having been finished, they give from one to three pecks *(tumu* or *maracal)* of grain, rice, a fowl, a sheep, (or fowls and sheep) to the *Jani* (or sacrificer).

I may add as regards the name adverted to at the commencement of this digest, that the hand writing sometimes leaves it uncertain whether the word by which they are designated should be *Cádulu,* or *Codulu,* but from the way in which the క is sometimes written, I think it is not meant to be introduced into the word, which is I believe *Codalu ;* but I make the remark that I may not wilfully lead into error. I am not sure if the she-buffalo often mentioned may not be *a cow ;* which, however, a Hindu would not like to acknowledge. As to the term *Baji* it is to me unintelligible. But I think the term may receive some illustration from a passage which I extract from an account of a visit to the Raj-mehal hills near Bhaugulpore in Upper Hindustan. It is the following :

" At 11 A. M. we set off to visit the neighbouring villages. On reaching the former (Dundah-goddah) we found the inhabitants of both villages assembled for pooja and drinking.—Nearly all the people, to the amount of at least 100, were in a state of intoxication. The noise of the drums, cymbals and singing almost prevented us from hearing our own voices. We witnessed the Pooja which had just commenced, —a fowl and a pig were sacrificed, and a part of the blood of the latter, mixed with cooked grain and tuddee, drank by the Daimno." It is this last preparation which seems to me to harmonize with the way in which *Báji* is spoken of sometimes as a compound-food, sometimes as a feast. I may remark that I have met with the above extract since making the translation, consequently this was in no way influenced thereby. The *Daimno* of the Raj-mehal people is apparently the *Jani* of the Khoonds, and it seems to me that there is a close similarity between the customs of the two sets of mountaineers. Several coincidences appear in the account whence the above extract is made. I have otherwise heard that the hill people of Raj-mehal speak a language like Tamil. The name for village in the above extract *goddah,* or *gudi,* is perfectly common in the south, and in parts of Mysore. Any similarity of languages between insulated localities, so distant from each other, argues in favour of an early general language throughout India.

In the translated paper there are some things that appear otherwise curious, as the pouring out libations, a custom so familiar to the classic scholar ; and an almost universal custom of heathen antiquity. The placing sticks and causing people to pass under, or through them, reminds one of the *Furca* of the Romans ; though the import of the act in either case differs. However not to dwell on such things, nor on resemblances to customs heretofore among the South-sea-islanders, we may advance to that sacrifice which is briefly alluded to at the close, the *merria* sacrifice, on that of a human victim. This custom also pre-

vailed in the South-sea islands; and I cannot think that the many resemblances are perfectly accidental.

Of the *Merria* or human sacrifices, the following has been forwarded by Mr. Stevenson, alluded to in the extract from his letter :—

Memorandum regarding Human Sacrifices among the Khoonds.— The sacrifice is offered to Thadha deveta (the earth), under the effigy of a bird. It is offered annually to propitiate the deity to grant favourable crops and seasons. The ceremony is performed at the expense, in rotation, of certain Mootas composing a circle, and connected together from local circumstances. It is impossible to ascertain the number of places in which the annual sacrifices take place, but they are very numerous. Besides the annual sacrifice, human victims are offered up byMootas, or by individuals, to avert any threatening calamity arising from sickness, murrain, or other causes. The victims may be of any caste, or sex, or age; (I have not however heard of an instance of Khonds being sacrificed): but grown males are the most esteemed, because the most costly. Children are purchased, and reared for years with the family of the person who ultimately devotes them to sacrifice, when circumstances demand a victim from him. They appear to be treated with every kindness, and, if too young to be conscious of their fate, are under no constraint—otherwise they are kept in fetters and guarded. There appears to be no difficulty in procuring victims; most of those that have been rescued were sold by their parents or nearest relatives, and this appears a very common practice. Persons of riper age are kidnapped, and there are individuals who follow a trade in human flesh, and supply victims by kidnapping or forcibly seizing children. The Khonds never sacrifice a criminal, or a prisoner captured in war. It must always be purchased—the price paid is from 60 to 200 Rupees, and the price is paid either in brass vessels, cattle, or coin, or partly in each.

The Janee or priest (who may be of any caste) officiates at the sacrifice, but he performs the *pooja* offering of incense, flowers, &c. to the idol, through the medium of the Toomba, who must be a Khond child under seven years of age. This child is fed and clothed at the public expense, and eats with no other person, and is not subjected to any act deemed impure.

For a month prior to the day of sacrifice, there is much feasting, intoxication and dancing round the victim, who is adorned with garlands, &c. and, the day prior to the sacrifice, is intoxicated with toddy, and made to sit, (if necessary tied with seven ropes) at the bottom of a post which has previously been planted with some ceremonies, and on the

top of which is an effigy of a bird, and at the foot of which a brass figure of the same bird is buried. The Khonds and others dance round the post to music, and addressing the earth, say, " O god! we sacrifice to you, give us good crops and seasons and health." Then the victim is addressed—" We have bought you with a price, not seized you, and now sacrifice you according to custom. No sin rests on us." On the following day the victim is intoxicated with toddy again, and anointed with oil. Each individual present touches the anointed part, and wipes the oil on his own head. They then proceed in procession around the village and its boundaries, bearing the victim, who is preceded by music and a long pole to the top of which is attached tufts of peacocks' feathers. On returning to the post, which is always placed near the village deity (*Gram devete*), here called "*Jakaree penoo*," represented by three stones, and near to which the brass effigy of a bird, before alluded to, intended to represent a peacock, is always buried. They proceed to dig a pit, and having killed in sacrifice a hog, the blood is allowed to flow into the pit. The victim, who, if it has been found possible, has been made senseless from intoxication, is seized by five or six persons, thrown into the pit, and his face kept pressed to the earth, till suffocated in the bloody mire. All cries, if any, are drowned by the noises of instruments. When supposed to be dead, the Janee cuts a bit of flesh from the body, and buries it with ceremony near the effigy and village idol, as an offering to the earth; all present then cut pieces of flesh and carry it to their own villages, where part is buried before the same idols, and morsels in the boundaries of the villages, or fields, to which it is carried in procession, with music, &c. The head and face remains untouched, and when the bones are deprived of flesh, they are buried with the head in the pit.

Subsequently to this horrid rite, a calf is brought before the post, and his four feet being cut off, it is left there till the following day, when women, dressed in male attire, and armed as men, drink, and dance, and sing round the post. The calf is then killed and eaten, and the Janee dismissed with a present of rice, and a hog or calf.

Captain Millar (43d Regiment N. I.) when at Coopautee, managed with much discretion to rescue no less than twelve victims; seventeen more have fallen into my hands, making in all twenty-nine. The first who made her escape to my camp, although closely fettered, disappeared after a few days, and I could never learn more of her. She was an elderly woman; of the remainder, ten were restored to their friends, and eighteen children from three to ten years of age, remain with Captain Millar and myself. These were all sold by their parents, or I have been unable to discover their history and origin.

This account differs in some particulars from other accounts which have been published. There may, however, be different modes followed: this account may be considered to be authentic.

The remaining documents to be adduced are two forms of oaths. The one alluded to by Mr. Stevenson is the following :—

Form of Oath.

1. A blood-sucker,
2. A bit of tiger's skin,
3. Peacock's feather,
4. Earth from the white-ants' hill,
5. Rice mixed with fowl's blood,
6. A lighted lamp.

The substance of the circumstance is first repeated by the swearing party, and a basket containing the following things being held before him, he proceeds with his oath, touching each object in the basket at that part of the oath which refers to that object :— the blood-sucker, the tiger-skin, &c.

"Oh father (god!) I swear, and if I swear falsely then, oh father! may I become shrivelled and dry like a blood-sucker, and thus die; may I be killed and eaten by a tiger resembling this blood-sucker, may I crumble to dust like this white-ants' hill, may I be blown about like this feather, may I be extinguished like this lamp."

In saying the last words he puts a few grains of the rice in his mouth, and blows out the lamp, and the basket with its contents is made to touch the top of his head.

Yeree ubba,	hahumoo,	hurrudda,	attamo,	mi,	dosha,	shiddee
Oh Father	I	Oath	take	by me	fault	if is

yera,	neekee	surruda suttumo	Yeree ubba.
on	that account	to me and mine	oh Father.

Ghoe, dingee,	Bassee, Bassee,	Sunnummoo.
blood-sucker like,	dry and shrivelled,	may I die.

Ghoyee, dingee,	Khradee hanee	nangee	yesta challa	tinee
A blood-sucker like,	a tiger may come	me	having killed	eat

Beera, dingee	Mhaihe	hanai.	Mendoo, kuttaka
white-ant hill-like	crumble away	may I come.	Peacock, feather

hanai	yengae sahe	yenjoo	dippo	dingee	yengee
may I be	blown away	this	lamp	like	this manner

nimee	mammo.
may I be,	extinguished.

The other form, of a special character, is as follows :

Oath taken by the chiefs of the Mootahs of Rottungen, and Chinungea, on the occasion of the settlement of a boundary dispute, which had been for many years the cause of war between the two districts.

" The dispute which has existed between us so long is now decided—we will forget it and remain in peace, and hold our lands according to the limits laid down. Whichever party acts otherwise, and causes disputes again to arise, let him be reduced to dust, and his race and name become unknown."

The parties administered the oath to each other, holding over the head of the swearing party a basket of the soil, whilst he repeated the words of the oath.

Such are the materials which I have endeavoured so to digest as to place them in a somewhat clear and intelligible order. I do not know that any remarks of mine, whether laboured, or otherwise, could add to the deep but melancholy interest, which these documents are calculated to excite. It is quite clear that these people are not Hindus ; though a few ideas may have been borrowed from the latter. The Khoonds are clearly in a state next to entire barbarism. I am told that people from the north speak of the *khoi*-mountaineers as wild, deformed, and of vindictive character ; so much so, that it is not safe to speak to one of them, as a real or imaginary affront is never forgiven, but if possible is avenged with blood. They are also said to be potent in the use of charms, and incantations ; but these may be idle tales. One cannot, however, but remark their dissolute and drunken habits, as in most semi-barbarous people ; a description of vice usually leading to vindictiveness, ferocity, and bloodshedding. And when ferocity and murder become parts of a people's religion, every thing else may be expected that is degrading to human nature. Philanthropists have a new field opened for their exertions ; and I would, with pleasure, anticipate the time when they may become a Christianized, civilized, humane, and respectable, people.

I have to solicit indulgence for any possible faults, that may have inadvertently entered into these observations, which have been prepared amidst many other, and very dissimilar, occupations.

[The foregoing article, based principally on information communicated by the late lamented Commissioner in Goomsoor, will, independent of its intrinsic value, be read with lively, yet melancholy, interest, as a posthumous relic of one, who, to the infinite regret of his many friends, and great loss of the Government, whose upright and talented functionary he was, has been cut off in the prime of life, and in the midst of a career which must have proved eminently useful to the country, as well as highly honourable to himself.—*Editor.*]

III—*Abstract of Eight Months' Meteorological Observations at Moulmein.—By* JAMES DALMAHOY, Esq. *of the Madras Medical Establishment. Physician to His Highness the Rajah of Travancore.*

The accompanying tables furnish a few data respecting the periodical oscillations of the barometer, and the heating power of the sun's rays at a station within the tropics. They contain also some other observations usually supposed to be connected with the movements of the barometer. As they refer to a period of eight months only, no general conclusions regarding the climate can be deduced from them, and therefore it was thought unnecessary to give a mean at the foot of each column.

Moulmein or Maulamyne, the principal station in the Tenasserim provinces, is situated in 16° 30′ N. L. and I believe about 97° 30′ E. L. It may be considered at the level of the sea, for the river, on the bank of which it lies, has free communication with the sea not eight miles to the westward, besides its more distant mouth at Amherst to the south. The observations were made at the height of thirty or forty feet above the surface of the river.

The barometer employed was a portable one of the syphon kind, and therefore required no correction except the reduction of the observations to a common temperature. The sound produced by striking the mercury against the top of the tube indicated that there was no air interposed. In making the observations, precautions were used to obviate the effects of friction between the tube and mercury. The barometer, also the wet-bulb thermometer, and one exactly similar for ascertaining the temperature of the air, were made by Mr. Robinson, of London. The thermometers were graduated to quarters of a degree of Fahrenheit's scale. The maximum and minimum thermometers were made by Mr. Adie, of Edinburgh, whose plan of introducing naphtha, above the mercury, in the former instrument, is completely successful in preventing the retraction of the index. The actinometer,* an instrument invented by Sir J. Herschel, was made by Mr. Robinson. It was observed only at apparent noon, and the glass plate in front of the bulb was always placed at right angles to the direction of the sun's rays. In making an observation, a board, just sufficient to intercept the direct rays of the sun, was held at some distance by an assistant, and the rise of the instrument during one minute was noted; the board was then suddenly withdrawn, and the rise during an equal interval again noted; the rays being once more intercepted, an observation similar

* See Reports of the British Association, &c. vol. ii. p. 379.

to the first was repeated. The quantity recorded in the table is the excess of the second of these observations above the mean of the first and third. The photometer was a portable one with the usual glass screen, and was procured from Professor Leslie's own maker in Edinburgh. The observations with it were made in the following manner. The instrument was exposed so as already to have attained its maximum at apparent noon. The direct rays of the sun were then suddenly cut off, and the degrees lost during *half* a minute were numbered and recorded. This method of using the photometer was suggested by the principle on which the observations with the actinometer are made. The rain was received in a tin vessel having its aperture horizontal and of known area. The water was then measured, and it was easy to observe the quantity of it corresponding to the thousandth of an inch in depth. Merely a thread and feather were used to shew the direction of the wind, and its velocity was only estimated by the help of a scale given in the appendix to Dr. T. Young's Lectures. The velocity recorded is the mean of the separate estimated velocities. Professor Forbes* has recommended the adoption of Lambert's method of registering the direction of the wind. According to this the south was denoted by 0° S. W. by 45° W. by 90° and so round the whole horizon. But to this plan it is a weighty objection, though apparently overlooked, that if the wind be registered as varying between S. W. and S. E. or between W. and E. always going round by S. the result will erroneously represent the mean direction of the wind to have been from the N.

Remarks on the Tables.

In table I, under the head thermometer, is given the mean minimum and mean maximum temperature; also the mean at 9½ A. M. and 9½ P. M. as these two latter periods divided nearly equally the intervals between the periods of least and greatest temperature, the mean temperature of the month is deduced from the observations at all the four. The time of maximum temperature seemed to be between two and three P. M.; it was sometimes hastened by the early setting in of the sea breeze.

The hygrometric state of the air was determined by Leslie's method, the mean temperature of his dew-point and corresponding tension of vapour having been deduced from the mean temperature of the air, and mean temperature of the wet-bulb thermometer. I am aware that the tension of vapour corresponding to the mean temperature of the dew-point is a little less than the mean tension, but the difference can seldom exceed what is due to two or three tenths of a degree of Fahrenheit's thermometer. The column marked dampness, gives the

* Reports of the British Association, &c. vol. i. p. 249.

quotient arising from the division of the number expressing the tension of vapour at the mean temperature of the dew-point, by that expressing the similar tension at the mean temperature of the air. The sixth or last column, under the head hygrometer, affords, in connexion with table II. data for calculating the amount of evaporation.

With respect to the quantity of rain recorded in the table, it is less than what usually falls during the corresponding period. The average annual fall of rain at Moulmein is above two hundred inches. Formulæ have been given for finding the mean fall of rain at any latitude, but it cannot be doubted that besides the distance of a station from the equator, its distance from the coast, the direction of the line of coast, the relative positions of the sea and land with respect to that line, and probably many other circumstances unite in influencing the amount of rain.

The times for recording the barometer were selected as furnishing its two maximum and one of its minimum heights. It did not appear however, that there would have been any sensible difference between the mean of the observations at $9\frac{1}{2}$ P. M. and $10\frac{1}{2}$ P. M. A comparison of the consecutive monthly differences of the barometer at the three daily periods of observation shews that, at each of these, the column of mercury decreased without intermission from January to June inclusive; in July, it again increased a little. The fall of the barometer may possibly have been caused by the shifting of the prevailing winds from the N. E. and N. W. to the W., S. W. and S. as indicated by table II., but there is nothing either in this, or the first table, to account for the increase of pressure in July.

With regard to the daily oscillations of the barometer, their magnitude is undoubtedly affected by local causes, but these latter ought perhaps only to be regarded as accidental disturbances of those general and constant causes on which the oscillations themselves depend. It appears, from the table, that both of the oscillations recorded increased from January until the end of March, and then diminished: in other words that though, as has been observed, the mean height of the barometer decreased, from month to month, at each of the three periods of the day, its decrease at $3\frac{1}{2}$ P. M. was more rapid, until the end of March, than at $9\frac{1}{2}$ A. M. and $10\frac{1}{2}$ P. M. The oscillations at a given latitude are supposed by M. Bouvard to vary in magnitude directly with the temperature, on the centigrade scale, of the period during which they occur. Is it not possible that they may also vary with the tension of the atmospheric vapour? It will be observed, on reference to the table, that this tension was greater at $9\frac{1}{2}$ A. M. and $9\frac{1}{2}$ P. M. than at $3\frac{1}{2}$ P. M. from February to May inclusive, while on the contrary it was less during January, June and July.

Professor Forbes* from a comparison of most of the recorded observations, has deduced a formula for finding the mean oscillation between 10 A. M. and 4 P. M. at any given latitude. The result of this for latitude 16° 30′ is 2.35 millimetres or 0.092 of an inch. The mean of the observations in the table cannot be considered the experimental mean at Moulmein, for, three out of the four unrecorded months being rainy, the former would almost certainly exceed the latter. The mean of 0.133 the greatest and of 0,077 the least quantities in the table, equal to 0.105, is probably very near the true mean. The difference between this and the result of the formula is a less fraction of the whole oscillation than occurs in a similar comparison in lat. 56° between the result of the formula and the mean of Professor Forbes's own observations; the errors in the two cases are however of opposite kinds.

The manner in which the observations in table III. were made, has been already noticed. The calculated altitudes of the sun at the period of the first observation on 7th January, and at that of the last on 30th April, were respectively 51° and 88° 17'. Supposing the atmosphere equally pervious, the ratio of the intensity at the former angle to that at the latter, is theoretically a little greater than 9-tenths, a ratio approaching much nearer to equality than it would have done if the altitudes had been smaller with the same common difference. It is remarkable that on the 14th January the photometer indicated 37, the greatest intensity recorded, and on the following day 32, the only other observation as great as the latter of these having been on the 30th April. It suggested itself to me at one time as probable that the apparent effect of the sun's rays might be influenced by the temperature of the instrument employed to measure it, but there can be no doubt that this and every other disturbing cause is excluded in the results obtained by means of the actinometer. The varying quantity of undissolved vapour lying in the path of the rays, offers perhaps the best explanation of the anomalous variations in their intensity, as was suggested by Dr. Richardson in explanation of the apparently great power of the sun's rays at Fort Franklin. Successive strata of thin vapour at a great height, may be conceived to intercept many of the heating rays, without causing a diminution of transparency sensible to the eye.

I regret extremely that the tables contain no observations on terrestrial radiation at night. The method of using the actinometer in the measurement of solar radiation, as already described, is applicable also to terrestrial radiation. Of course in this case the glass plate between the bulb of the instrument and the sky would need to be removed: it would also be necessary to lengthen the time of observation, and,

* Transactions of the Royal Society of Edinburgh, vol. xii.

in order to admit of comparison with other experiments, it ought further to be determined to what portion of the whole heavens, and in what direction, the instrument was exposed. It may be remarked that the method of measuring the intensity of terrestrial radiation by the maximum difference between the shaded and exposed thermometers is subject even to greater error than in the case of solar radiation, for it is evident, from the extremely heavy dew on a clear night, that the whole surface of the ground attains the temperature of the dew-point, and hence a detached thermometer must sink below it. But as soon as this happens, the decrement of temperature can no longer be a measure of the intensity of radiation in the same sense it was before, for there is now a continual influx of heat to the bulb from the condensing vapour. It might easily be shewn by the same process of reasoning employed to establish the dew-point formula, that if the tension of vapour corresponding to the minimum temperature of the exposed thermometer, be subtracted from the tension of vapour at the dew-point, and the difference be multiplied by 87, this product will express the additional number of degrees, on Fahrenheit's scale, which the exposed thermometer would sink, were it not for the dew.

P. S.—I venture to add, in a postscript, a few remarks which, while they are not altogether foreign to the subject of this paper, are not worthy of a separate place.

It is sometimes required to determine the internal diameter of a barometer tube when circumstances prevent its direct measurement. As this method of doing so, though easily derived from an elementary optical proposition, may not immediately suggest itself to those having only accidental occasion for it, it is here annexed. Apply the points of a pair of compasses to the external surface of the tube, and holding the eye opposite to them, and as far removed as is consistent with distinct vision, measure the least distance between the parallel sides of the bore. Two-thirds of this quantity is nearly equal to the true internal diameter. A nearer value is obtained by the following rule: add to the external diameter of the tube twice the distance of the eye from one of the points of the compasses, and divide by twice the distance of the eye; the product of this quantity into the approximate value already found, is very nearly equal to the internal diameter of the tube. When the external diameter is .333 of an inch, the apparent internal diameter .12 of an inch, and the distance of the eye 4 inches, the results of the two foregoing approximations, and of an exact calculation give, respectively, as the values of the internal diameter, .08 of an inch, .0833 and .08367.

TABLE I.—ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE

Year.	Month.	Barometer.					Thermometer.						Hygrometer at			
		Mean at $9\frac{1}{2}$ A. M.	Mean at $3\frac{1}{2}$ P. M.	Mean at $10\frac{1}{2}$ P. M.	Mean depression between $9\frac{1}{2}$ A. M. and $3\frac{1}{2}$ P. M.	Mean elevation between $3\frac{1}{2}$ P. M. and $10\frac{1}{2}$ P. M.	Mean at $9\frac{1}{2}$ A. M.	Mean at $9\frac{1}{2}$ P. M.	Mean minimum.	Mean maximum.	Mean temperature.	Mean daily range of temperature.	Mean of the wet bulb thermometer.	Mean difference between the dry and wet thermometer.	Calculated mean temperature of the dew-point.	Tension of vapour at the mean temperature of the dew-poi nt.
1835	Dec.	29.990	29.877		0.113		72.85	73.28	66.65	81.7	73.62	15.05				
1836	Jan.	29·990	29.869	29.942	0.121	0.073	70.4	71.0	65.3	80.0	71.67	14.7	64.6	5.8	61.1	0.543
,,	Feb.	29.966	29.839	29.918	0.127	0.079	71,75	72.6	65.8	82.6	73.19	16.8	67.43	4.32	65.1	0.619
,,	Mar.	29.936	29.803	29.898	0.133	0.095	77.5	77.0	71.85	85.0	77.84	13.15	72.5	5.0	70.2	0.734
,,	April	29·881	29.756	29.834	0.125	0.078	81.7	80.57	76.35	88.8	81.85	12.45	76.38	5.32	74.2	0.832
,,	May	29.827	29.717	29.795	0.110	0.078	78.6	78.15	74.65	83.3	78.67	8.65	75.6	0.0	74.3	0.835
,,	June	29·768	29.690	29.756	0.078	0.066	77.86	77.07	74.55	81.0	77.62	6.45	75.55	2.31	74.6	0.843
,,	July	29.803	29.726	29.797	0.077	0.071	77.1	76.2	73.8	80.45	76.89	6.65	75.1	2.0	74.25	0.834

NOTE.—The mercurial column in the barometer is reduced to 32 Fahr. The evening observations mission of nine days occurred in all the observations of May, with the exception of those on the quan

JRING A PERIOD OF EIGHT MONTHS, AT MOULMEIN.

½. M.		Hygrometer at 3½ P. M.						Hygrometer at 9½ P. M.						Pluviometer.			
Mean dampness, saturated being	Difference between the tension of vapour at the mean temperature of the air and of the dew-point.	Mean of the wet bulb thermometer.	Mean difference between the dry and wet thermometer.	Calculated mean temperature of the dew-point.	Tension of vapour at the meam temperature of the dew-point.	Mean dampness, saturated being = 1.	Difference between the tension of vapour at the mean temperature of the air and of the dew-point.	Mean of the wet bulb thermometer.	Mean difference between the dry and wet thermometer.	Calculated mean temperature of the dew-point.	Tension of vapour at the mean temperature of the dew-point.	Mean dampness, saturated being = 1.	Difference between the tension of vapour at the mean temperature of the air and of the dew-point.	Fall of rain in inches between 6 A. M. and 6 P. M.	Fall of rain in inches between 6 P. M. and 6 A. M.	Fall of rain during the 24 hours.	Number of times on which fog was observed before 9 A. M.
																0.5	2
.7	0.191	68.8	10.7	62.9	0.576	.584	0.409	65.0	6.0	61.4	0.548	.730	0.202	0	0	0	9
.8	0.150	70.13	11.6	64.0	0.597	.565	0.460	67.6	5.0	64.9	0.615	.777	0.176	0	0	0	16
.7	0.192	73.58	10.69	68.6	0.694	.605	0.453	72.25	4.75	69.9	0.724	.798	0.184	0	0	0	13
.7	0.224	76.36	11.74	71.3	0.758	.588	0.532	76.08	4.49	74.0	0.827	·810	0.193	0	0.103	0.103	3
.8	0.121	76.2	6.0	73.7	0.819	.763	0.255	75.15	3.0	73.9	0.824	.872	0.121	8.896	17.494	26.390	0
.9	0.093	76.41	3.76	74.9	0.851	.844	0.157	75.22	1.85	74.4	0.838	.919	0.073	17.671	14.691	32.362	0
.9	0.079	75.8	3.5	74.4	0.838	.853	0.143	74.4	1.8	73.6	0.817	.921	0.070	8.303	16.669	24.972	0

f e barometer were made during January at 9½ P. M. during the other months at 10½ P, M. An inter-
t of rain.

TABLE II.—*Shewing the direction and estimated velocity of the wind.*

		N.		N. E.		E.		S. E.		S.		S. W.		W.		N. W.		Calm.
1836		No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.
Jan.	9½ A. M.	1	4.	20	4.5	3	5.	7	6.	0	0	0	0	0	0	0	0	0
	3½ P. M.	0	0	1	5.	0	0	1	6.	0	0	2	5.	2	3.	25	3.5	0
	9½ P. M.	1	1.	14	2.5	1	2.	0	0	6	2.	5	1.75	0	0	0	0	4
Feb.	9½ A. M.	3	4.5	20	3.	2	3.5	4	5.	0	0	0	0	0	0	0	0	0
	3½ P. M.	0	0	0	0	0	0	0	0	1	8.	3	5.	12	5.5	13	4.	0
	9½ P. M.	0	0	2	1.	0	0	0	0	12	3.	14	2.75	0	0	0	0	1
Mar	9½ A. M.	2	3.5	17	3.	0	0	0	0	1	1.	7	3.	2	3.	0	0	1
	3½ P. M.	0	0	0	0	0	0	0	0	0	0	5	8.	24	6.25	2	5.	0
	9½ P. M.	1	1.	5	4.25	2	3.	0	0	10	3.	12	3.75	0	0	0	0	1
Apr.	9½ A. M.	1	3.	1	1.	1	1.	0	0	2	4.	6	4.	13	2.5	2	2.	1
	3½ P. M.	0	0	0	0	0	0	0	0	1	6.	16	8.25	12	9.	1	10.	0
	9½ P. M.	0	0	0	0	0	0	0	0	6	4.	22	5.	2	3.	0	0	0
May	9½ A. M.	1	1.	1	3.	3	1.	3	2.5	3	5.	2	2.5	6	1.5	0	0	4
	3½ P. M.	0	0	0	0	0	0	0	0	7	4.75	8	6.	6	5.25	0	0	0
	9½ P. M.	0	0	0	0	1	1.	3	3.	6	3.75	6	5.25	2	3.5	0	0	3
June	9½ A. M.	0	0	2	2.	2	2.5	2	3.	7	1.5	4	2.	3	1.5	0	0	8
	3½ P. M.	0	0	0	0	0	0	1	6.	10	4.75	12	4.	5	3.75	0	0	2
	9½ P. M.	1	2.	0	0	2	2.	2	3.5	5	3.	0	0	3	2.25	0	0	17
July	9½ A. M.	1	2.	2	2.5	0	0	2	2.5	7	1.25	4	2.75	6	2.	1	3.	8
	3½ P. M.	0	0	0	0	0	0	0	0	4	4.5	12	5.	10	3.	1	2.	4
	9½ P. M.	1	1.	2	2.	1	1.	4	1.75	3	3.25	5	3.	1	1.	1	4.	13

Note.—In the above table the velocity of the wind is expressed in miles per hour, but merely by estimate.

TABLE III.—*Shewing the heating power of the Sun's rays at apparent noon.*

1836.	Date.	Photometer.	1836.	Date.	Actinometer.	Photometer.	1836.	Date.	Actinometer.	Photometer.
Jan.	7	24	Feb.	20	10.5	24	March	30	9.25	22
	8	30		22	11.25	23		31	10.5	23
	9	30		23	10.	22	April	2		22
	11	2		24	10.5	21		4	9.5	19
	12	24		25	9.25	21		5	2.25	3
	13	23		26	11.	24		6	11.	18
	14	37		27	11.	23		7	11.	21
	15	32	March	1	9.5	23		8	11.	26
	16	26		2	9.25	21		9	8.5	16
	19	7		3	9.	20		11	10.	20
	20	24		4	10.	24		12	11.25	25
	21	22		5	9.75	19		13	13.	25
	22	23		7	8.5	18		14	12.5	30
	23	22		8	8.25	20		15		26
	26	22		9	7.5	15		17	11.25	21
	27	26		10	9.5	18		18	10.25	24
	28	23		11	12.	24		19	10.75	26
	29	25		12	8.75	20		20	6.5	15
Feb.	1	20		14	12.75	22		21	11.	28
	3	26		15	9.5	18		22	7.25	20
	4	24		16	7.5	17		25	12.	27
	5	26		17	7.5	14		26	12.5	28
	6	26		18	8.	15		27	11.25	25
	8	27		19	8.	13		28	11.5	29
	10	25		21	1.	3		29	12.	29
	11	23		22	5.	11		30	13.5	32
	12	22		23	0.5	2				
	13	24		24	6.5	12				
	15	24		25	0.75	1				
	16	24		26	7.5	15				
	17	21		28	9.5	24				
	18	22		29	3.5	7				

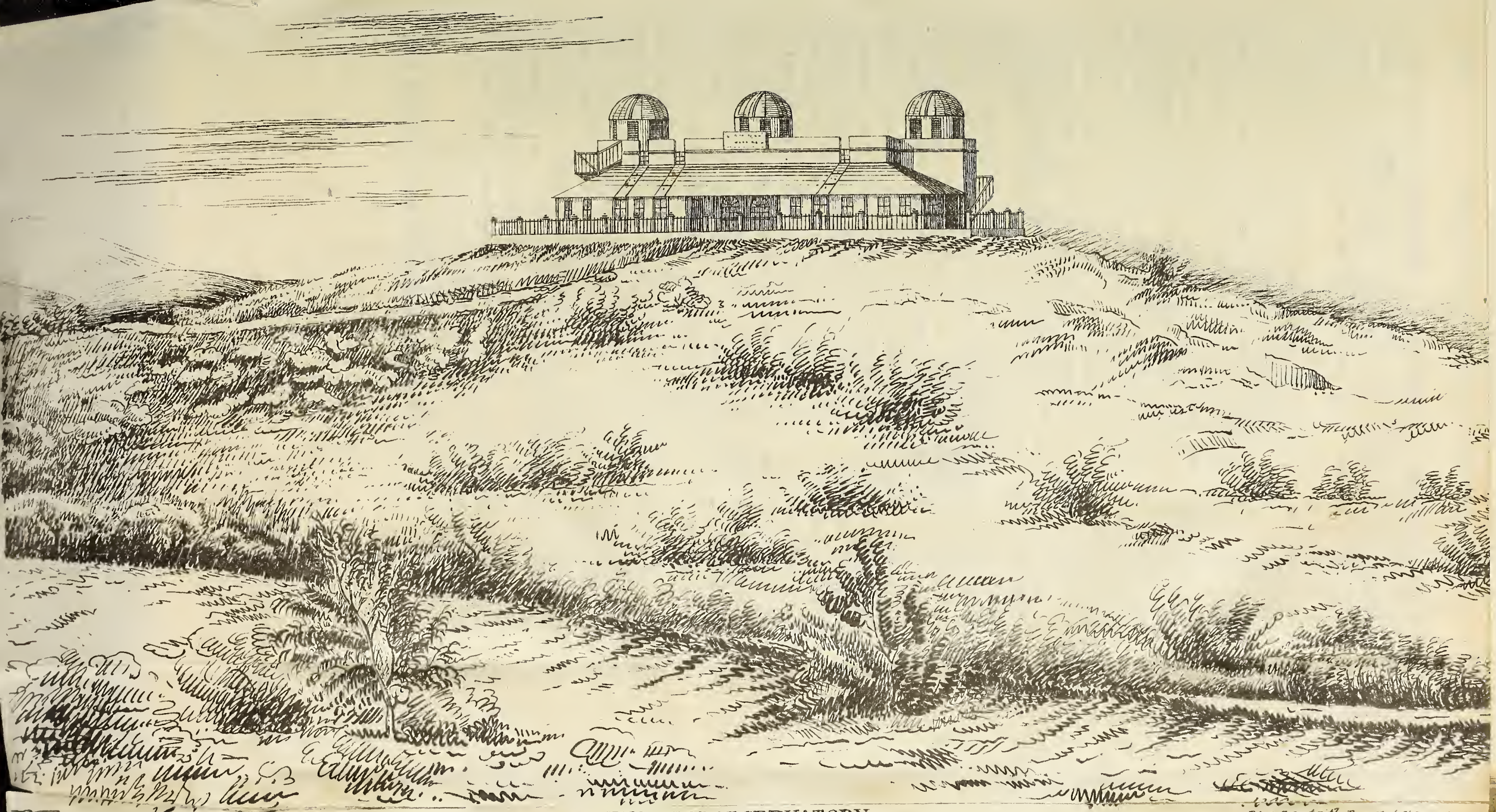
Note.—For an explanation of this table see the accompanying remarks. It may be remarked that the observation of the photometer was not strictly simultaneous with that of the actinometer, but immediately after it.

IV.—*Description of an Observatory lately established at Trevandrum, by* HIS HIGHNESS *the Rajah of Travancore.*—By JOHN CALDECOTT, Esq. *Astronomer to His Highness.*

HIS HIGHNESS the RAJAH OF TRAVANCORE, already celebrated for the munificence with which he promotes the education and mental improvement of his subjects, resolved in the latter part of last year on the establishment, at his capital, Trevandrum, of an Observatory of a superior kind; with the double view of affording his aid to the advancement of astronomical science, and of introducing by its means correct ideas of the principles of this science among the rising generation under his government; and having confided to me the superintendence of the institution as Astronomer, I take this early opportunity of introducing it to the notice of the public, by a short description (which may be enlarged hereafter) of the three great features of its future usefulness, viz. the building—the instruments—the locality—convinced that the description of a new Observatory so situated, and established with such objects, succinct and somewhat imperfect as at this early stage it must necessarily be, will still be received with lively interest, not only by astronomers in particular, but generally by the many who are now contemplating, with sympathy and admiration, the rapid strides with which intellectual culture is advancing among our native brethren of India.

1.—THE BUILDING.

When it devolved on me to design a plan by which the liberal intentions of His Highness might be carried into the most complete effect, it became with me a matter of serious consideration, how the utmost benefit to science might be derived from the opportunity afforded by the proposed institution, without making any very great demand on the funds of the state; and I very soon came to the conclusion that no outlay, beyond what was absolutely necessary to effectiveness, should be made on the building, but that no expense should be spared in procuring instruments of such a size and quality as would ensure to an Observatory, where they were judiciously and actively made use of, a rank second to none in the world. Being supported in this view of the case by Colonel Fraser, the British Resident at Travancore (a gentleman most pre-eminently qualified to judge on such a matter), the plan now to be explained was sanctioned by His Highness, and the building has since been completely and most satisfactorily erected, by Lieut. Horsley, of the Madras Engineers, through whose kindness I am enabled to accompany this, with two perspective views, a plan, section, and elevation, which will render but a short verbal explanation necessary.



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TREVANDRUM OBSERVATORY.

View taken from the North West.

BRITISH MUSEUM
NATURAL HISTORY

The extreme dimensions (i. e. including the verandahs) are seventy-eight feet in length, east and west, and thirty-eight feet in breadth, north and south; these, although small compared with most other public Observatories, will, it is hoped, prove amply sufficient for all useful purposes.

The hill on which the observatory is erected is a solid mass of laterite, in which granite is largely disseminated, and is so hard as to be penetrated with great difficulty; but little depth was therefore required for the foundations, which are accordingly only sunk one foot below the surface, on which the granite bases for the instruments are erected—this surface is by excavation three feet below the general level of the soil outside, and three and a half feet below the floor of the observing rooms. On it is erected, nearly to the height of the floor, but without contact with it, or with the surrounding walls, a solid mass of granite masonry for each instrument, consisting of large pieces of stone clamped together; that in the transit room (*a*) is ten feet long, by four feet broad; that in the circle room (*c*) ten feet square, and that in the centre room (*b*) six feet square. The walls are two feet in thickness, built of squared stones of laterite, and afford a clear height in the observing rooms of seventeen feet. The meridional openings are three in number, each two feet wide, and extend across the building to within three feet of the ground on each side—they are well secured and conveniently laid open by shutters covered with canvas, and painted, and having slips of copper over the abutments. The roof is flat, and on the centre of it is erected a wooden circular building, of nine feet diameter, with a revolving dome which covers a solid pillar of granite, coming up through the centre room without contact with floor, roof, or any part of the building, and terminating about three feet above the flat roof. This pillar is two feet in diameter at the top, and four feet at bottom, and is erected on the granite base of six feet square—the pillar consists of five pieces in the form of a frustrum of a cone. Two other revolving domes of the same size are placed over the circular rooms at the southern corners of the Observatory, which are square turrets of solid masonry. The roof or terrace is conveniently approached by two stair-cases outside the building, and winding round the turrets. The verandahs are divided into small rooms as sleeping apartments, computing offices, library, &c.

The clear dimensions (inside) of the transit room (*a*) are 14 ft. by 12.
Do. of the circle room (*c*) .... 14 ft. by 12.
Do. of the centre room (*b*) .... 20 ft. by 12.

The breadth of the verandah is eleven feet.

On the north and south faces, and let into a panel, formed in the parapet wall, are to be placed marble tablets, bearing an inscription, as follows :—

THE TREVANDRUM OBSERVATORY,
FOUNDED BY
HIS HIGHNESS
Sree Padmanabha Dassa Vunchee
Baula Rama Vurma Koola Shakhur
Kireeta Pukee Swatee Rama Rajah Bahadoor
Munnei Sooltan Shemshair Jung.

A. D. 1837.

Soobrow Dewan.

Colonel James Stuart Fraser—*Resident.*

John Caldecott, Esq.—*Astronomer.*

W. H. Horsley, Esq. Madras Eng.—*Architect.*

The inscription on the north face being in English, and that on the south a translation of the same in Malayalim.

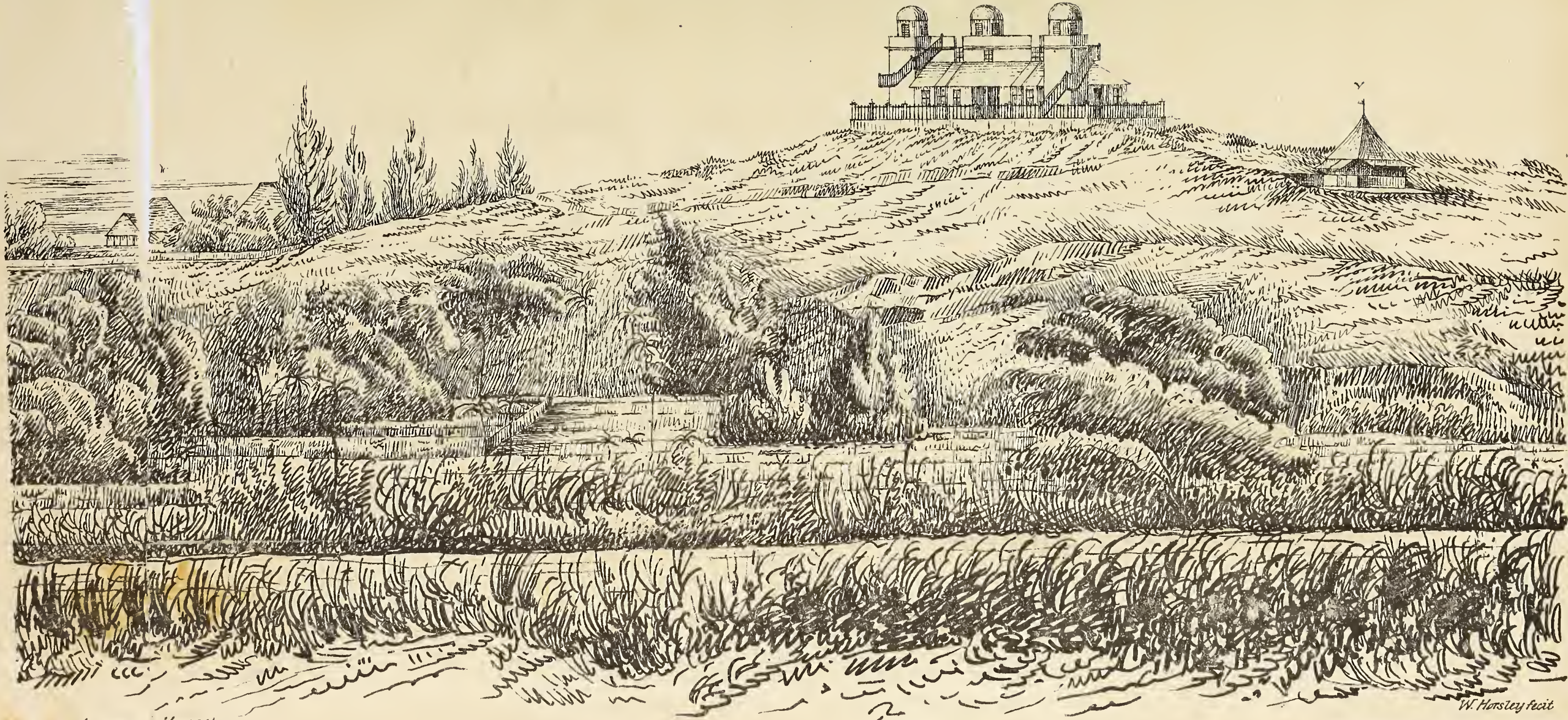
This building was commenced last October, and is now finished, with exception of a little work connected with the granite pillar in the centre room.

2.—The Instruments.

Will comprise—1st. A transit of five feet focal length, and of four inches aperture—ordered from Mr. Dollond, with very particular instructions, that it shall be the most perfect in his power to make. This will be placed in the western meridian room.

2d. A transit clock to be so placed, in a recess cut into the granite pillar in the centre room, as to be easily seen and heard by the observer at the transit instrument, when the door between the rooms is open. This is intended to be as perfect a piece of workmanship as London can furnish.

3d and 4th. Two mural circles of five feet diameter, to be both placed in the eastern meridian room, on the opposite faces of a solid granite wall—one instrument being intended for direct observations of polar or zenith distances, while the other makes simultaneous observa-



Y . Astronom House.
Y Meteorological ngalow.

TREVANDRUM OBSERVATORY

View taken from the South West.

Drawn on Transfer Paper by Dumph
Printed by Winchester.

BRITISH MUSEUM [illegible]

tions by reflection from quicksilver in the manner now practised at Greenwich. These two instruments are ordered respectively from Mr. William Simms, and Mr. Thomas Jones, with the same instructions as to perfection as those given to Mr. Dollond for the transit instrument.

5th. A clock, exactly similar to the transit clock, to be placed in a corresponding recess on the opposite side of the same pillar.

6th. An altitude and azimuth instrument, having 18 inch, and 15 inch circles, with three micrometrical microscopes to each, made by Mr. Simms, to be placed on the top of the granite pillar above the middle room, and under the revolving dome No. 1. This instrument having been ordered by me, for my own use, about two years ago, has just arrived at Madras, and is now on its way to me by land.

7th and 8th. Two powerful telescopes, one of the refracting and the other of the reflecting kind, with micrometers and all appurtenances for observations on the double stars, &c. to be placed under the revolving domes Nos. 2 and 3.

Besides these principal instruments, the Observatory will be completely furnished with meteorological, magnetic, and pendulum, instruments and apparatus; and the assistance afforded by His Highness in the observing and computing departments, is as complete and liberal as every other part of the establishment.

I may here mention that until these instruments are received from England, observations will be carried on with small but very excellent ones of my own—consisting of the altitude and azimuth circle above mentioned—a thirty inches transit instrument—an equatorial, by Troughton and Simms—a forty-six inches refracting telescope—chronometers—reflecting circle, &c. &c.

I also take this opportunity of announcing that a system of hourly observations throughout the day and night, of the thermometer, barometer, and hygrometer, has already been commenced at this observatory, the result of which will be duly made public : and this, as supplying an important desideratum in the science of meteorology, will doubtless be received by all cultivators of that branch of physics, with the consideration and gratitude which the present Rajah of Travancore will by it eminently entitle himself to.

3.—The Locality.

The Trevandrum Observatory stands on an insulated hill, about sixty feet high, and 195¾ feet above the level of the sea (as ascertained by levelling), from which it is distant, in a straight line, about two miles. It commands an extensive and beautiful view of an undulating and finely variegated country towards the north, the east, and the south—and (overlooking the declivity towards the sea and its fringe of cocoa-

nut trees) of the sea horizon to the west. The eastern view is terminated by the Ghat mountains, the highest of which subtend an angle of about 2° 15′, the low hills to the north intercept only 45′ : and from N. N. W. to S. E. the view extends to the sensible horizon itself. The country intervening between the Observatory and these boundaries, on the land sides, consists of hills covered with low jungle, having strips of rice-ground meandering between them, and topes of trees interspersed. On a cliff, between three and four miles distant to the south, and of the same elevation above the sea as the Observatory hill, are built walls of masonry, intended to receive three meridian marks; and to the north an equally eligible situation may be selected for those in that direction.

The geographical situation of the Observatory, as nearly as I have yet been able to ascertain it, is as follows :—

Latitude 8° 30′ 35″ north.

Long. 76° 59′ 45″ or 5*h.* 7*s.* 59*m.* east.

These positions cannot, I think, be in error to the amount of 5″ in latitude, or of 2′ (in time) in longitude—they will, however, be settled with more precision shortly.

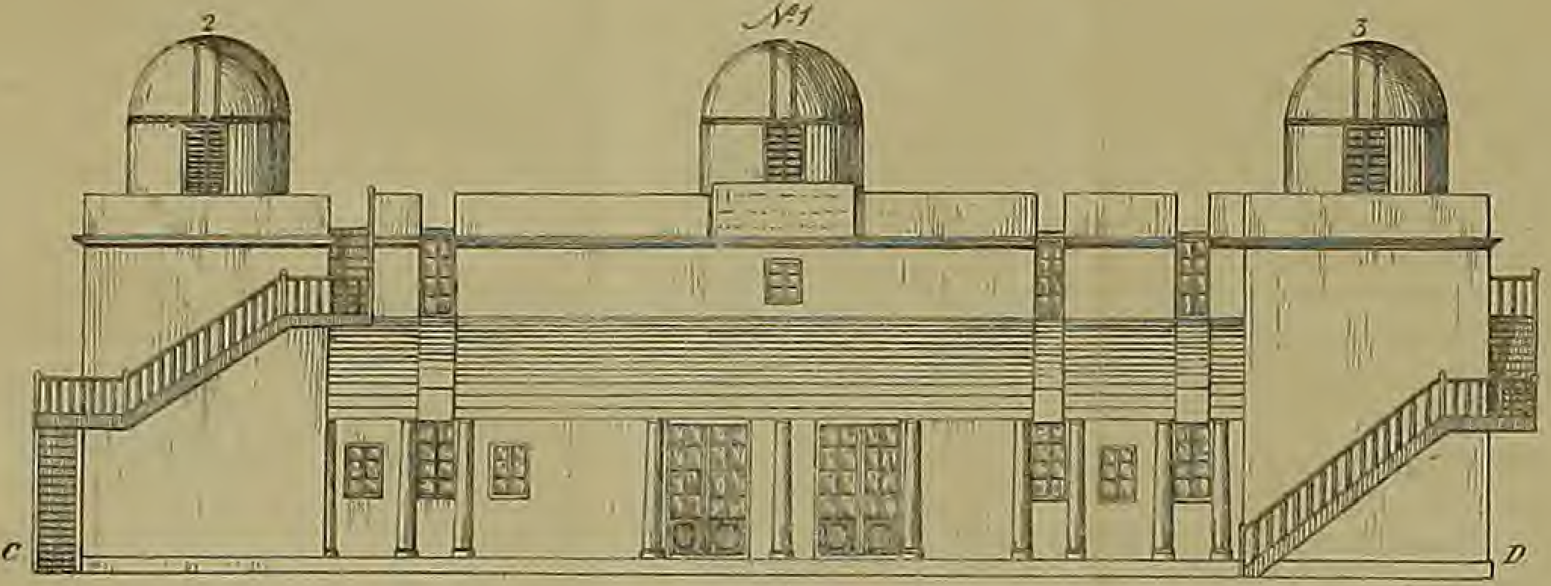
With the expression of my earnest hope, that the Trevandrum Observatory may, hereafter take an important part in celestial research, and prove useful to science, I shall conclude this brief account.

V.—*The Objections made by* T. G. Taylor, Esq., *H. E. I. C.'s Astronomer to the Balance Self-Registering Barometer considered ; and further Remarks respecting that Instrument.*—By William Gilchrist, Esq. *of the Madras Medical Establishment.*

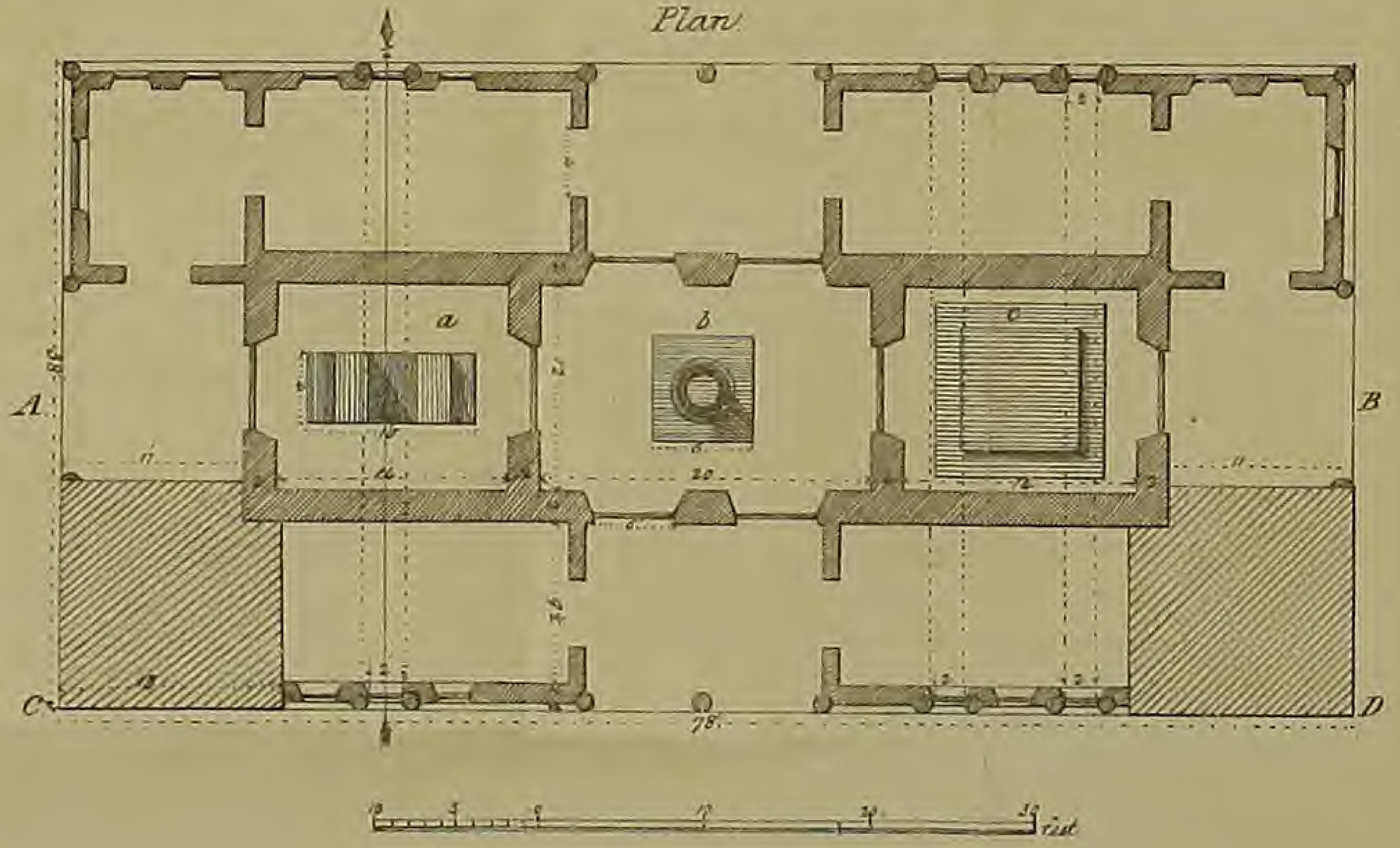
In the 15th No. of this Journal Mr. Taylor has advanced several objections to the principle and details of the plan for a self-registering barometer, proposed by me, in the 14th No. These objections I have considered with the attention due to the source whence they emanated, and being humbly of opinion, that those which refer to the principle of the plan do not hold good, I purpose, in the present communication, to state my reasons for thus considering them. With respect to those that refer to the details, it will afterwards be seen that they are easily got over.

I shall (although in Mr. Taylor's paper it be last stated) first consider the objections referring to the principle of the plan, because, if they hold good, they undoubtedly would be what he considers them " fatal to the balance barometer." In page 308, No 15, of the Madras Journal, the case is supposed of an increase of atmospheric pressure equivalent to half an

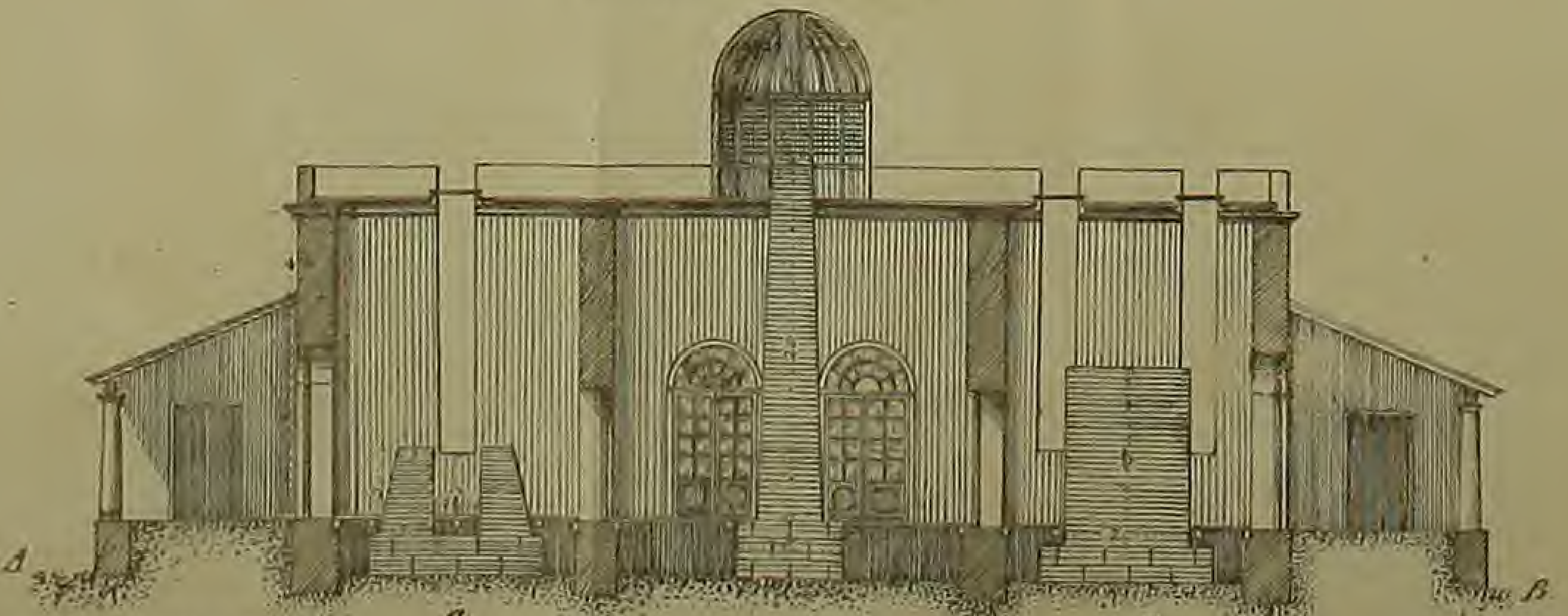
South Front Elevation
of the
TREVANDRUM OBSERVATORY.



Plan



Longitudinal Section.



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BRITISH [illegible] UM

inch of the mercurial column, then follow these words "the surface "*cc* rises to *ee* and consequently an additional weight (proportion- "al to *ec*) is imposed upon the barometer end of the balance; now "the effect of this weight being to lower the whole tube bodily, it fol- "lows that a further rise of the surface *ee* will take place, and that, "successively, cause and effect will ensue until the entire tube is fill- "ed, or the end of the tube 'brought up' by the bottom of the cis- "tern." In this sentence I understand by the phrase "the whole tube bodily" the tube and its contained mercury; and by the phrase "further rise" not a rise above 29.5 (the height to which by supposition the mercury has by increased atmospheric pressure risen) but *a second rise*, to that height, the mercury being considered to have fallen with its containing tube, its top surface goes below 29.5, but remains below it only temporarily, as the atmospheric pressure a second time forces it up to that height.

Presuming this to be Mr. Taylor's meaning, I am humbly of opinion that this alternate rise and fall of the mercurial column, does not obtain;—granting for a moment it does, I would arrive at a conclusion as to its effects, different from the one mentioned in the sentence quoted. What causes the tube in the first instance to commence descending? We both answer, the additional weight of half an inch added to the mercurial column. If then the mercury with the tube descends half an inch, it is evident that the mercurial column is shortened to its original length, and consequently the additional half inch weight of mercury is removed; so that the tube, being thus freed of the weight which caused it to descend, ought, I should think, instantly to rise, and remain up until reloaded by a second rise of mercury. By this alternate loading and unloading a perpetual alternate rise and fall of the tube would occur, and of course a perpetual oscillation of the balance: it would appear, however, Mr. Taylor considers that the tube thus lightened will not re-ascend, but, by some means, not mentioned, it will *remain down*, while the mercury makes a *second* rise. But that this alternate rise and fall of the mercury does not occur, will, I think, appear evident when we reflect that the mercurial column is supported by the atmosphere and by that only—the tube merely prevents air reaching the top surface of the mercury, and confines it to columnar limits—when the tube is moved up and down it glides as it were over the mercury, exactly as it would do over a rod of any solid substance, were this substituted for the liquid metal. It is almost superfluous to add this has been proved by experiment.

It does at first sight appear somewhat incredible that the mercurial column, in the case of increase of atmospheric pressure, should continue rising; while the tube containing it, when suspended from a balance, is descending—for the ascent of the former and the descent of the latter

are simultaneous movements. But the enigma is solved the moment we comprehend that there are really two balances concerned, which have a common counterpoise—namely, the mercury. The one balance is composed of this and the atmosphere,—two fluids, the easy mobility of the particles of which allows a ready mutual counterpoise; the other balance is the visible one, of which the mercury and its containing tube at one end, and weight at the other, are counterpoises. Comprehending this, it is easy to trace what obtains, when an increase of atmospheric pressure occurs; the air forces into the tube mercury equal in quantity to its increased weight, and thus effects a counterpoise. But this increase of mercury destroys the equilibrium previously existing between it and the weight; the former preponderating, its end of the balance necessarily descends, but while the tube is descending, the mercury and air preserve their equilibrium, so that the former remains, in the case supposed, at 29.5 inches above the surface of that in the cistern, while the tube slides over it in the manner already described. It may be said that this explanation offers an objection to the balance barometer *more serious* than the one advanced by Mr. Taylor; inasmuch as his shows only an intermitting pull, while this shows a constant one. If no check to the unlimited descent of the tube existed, this would hold good; but let us now attend to what occurs to the lower portion of the tube. Here, as Mr. Taylor remarks, "it must be "recollected that the part of the tube immersed in the quicksilver, lessens the weight imposed upon this end of the balance, to the amount "of the weight of an equal volume of quicksilver." When, therefore, atmospherical pressure causes a given volume of mercury to enter the tube, this descends from increased weight, and necessarily dips into the mercury in the cistern: but this dipping causes the tube to lose so much of its weight as is equal to the volume of mercury it displaces;—so when the volume of mercury thus displaced equals that which entered the tube, an equilibrium is effected; the tube has lost the weight it gained; a further dipping would make it lighter than the counterweights, because, the mercury remaining at 29.5, no additional weight is added by the column; while the further descent of the tube into the mercury makes it as much lighter as the volume of quicksilver it displaces; a further descent of the tube is thus prevented, and if it forced down further than the point at which this equilibrium occurs, it WOULD RISE to that point when the foreign force thus depressing it is removed. Here, then, in this principle of specific gravity, we observe a *third* balance concerned in the balance self-registering barometer; which, like the one consisting of the atmosphere and the mercury, is of the nicest sensibility; and the third balance discharges the important function of preventing the unlimited descent of the tube. The above are the reasons that induce me to think that the *principle* of my plan is correct.

Although this principle of specific gravity is necessarily concerned in the balance barometer, it will not prevent the tube descending further than a given distance, unless a certain relation exists amongst the portion of the apparatus concerned in that principle. Thus, if the tube be of a wide bore and very thin, so great a length of it would dip into the cistern, to displace a volume of mercury equal to what entered the tube by atmospheric pressure, that it might touch the bottom before the equilibrium were effected. Moreover, in the case of tube with expanded top, such as recommended in the original description, the tube increases in weight merely from descending, as this descent (as will afterwards be particularly shown) magnifies a portion of the narrow column of mercury, to the area of the large bore at top. It is not therefore to be inferred from the mere inspection of the plan, that this principle is the intended check to the unlimited descent of the tube. These remarks I consider it only justice to Mr. Taylor to make, because I have no doubt that, owing to my omitting to mention in the description of the plan that this is the check to the unlimited descent of the tube I had in view, he was induced to object to the balance portion of the apparatus. In the description of the plan (Madras Journal No. 14, page 27) I mentioned, that a balance, on the usual principles, will suit the purpose of the barometer ; and the details of its construction there given, are, as there acknowledged, those recommended for delicate balances by Mr. Braddock, a gentleman to whose mechanical ingenuity and scientific attainments the pages of this Journal bear ample testimony. In such a balance, the centre of gravity is but a small remove below the fulcrum, so that with reference to Mr. Taylor's *first* diagram, the product of a very small additional weight (although much less would do, say 7 grains equal to $\frac{1}{1000}$ of an inch of the mercurial column in the upper part of the barometer) into $a\ e$ would exceed the product of the weight on the end b into $b\ f$, how low soever a descends ; consequently, did no check to unlimited descent exist, the barometer end of the balance, always preponderating, would descend, and allow the tube to go down until it would reach the bottom of the cistern. In the absence of any mention of the required check it occurred to Mr. T. to place it in the balance ; and, as the delicate one proposed, did not suit his views, he proposes to modify the balance in question, by placing the centre of gravity considerably below the fulcrum ; in the particular case stated " about two inches." This ingenious idea of Mr. Taylor's would of course effect the object in view. The two objections which he mentions may be urged against it, do not appear of much importance, for with respect to the *first*, simply by moving a weight up and down a screw, may be effected the adjusting of " the axis of suspension to the height above the centre of gravity as shall render the scale we have adopted correct :" and with respect to

the *second*, which virtually is the necessity of having "recourse to computation," if this is to be considered an objection, what would become of Science—more especially of the department of which Mr. T. is the industrious cultivator? A more serious objection to it is, that it blunts the sensibility of the instrument, for, *ceteris paribus*, the lower the centre of gravity is placed below the fulcrum, the less delicate is the balance, and as this objection does not hold good with respect to the specific gravity check, it appears to me the more eligible one. In the weighing balance, the centre of gravity is placed below the fulcrum, to produce oscillation; also horizontality of beam, when equal weights are in the scale pans, but as oscillation is not required in the balance barometer the first variety of beam, named by Mr. Taylor, may be used, since the least additional weight moves it, while it is prevented upsetting by the dip or the immersion of the tube into or out of the mercury. In this variety of balance, having also the points of suspension in the same plane with the fulcrum, there is no tendency to move in any direction when equality of weight exists, but remains equally at an angle with the horizon as parallel to it; this therefore is exactly the balance wanted. If I understand Mr. Taylor aright, he considers objectionable the quantum of weight that will necessarily be on the balance, namely "tube of iron," column of "mercury," &c. It is no doubt true that the more a balance is loaded, it is the less delicate, but in the present case this appears more a theoretical than a practical objection, inasmuch as "in Europe, where every obstacle in the shape of workmanship vanishes," balances are made, which, when loaded much heavier than what the balance of the barometer requires to be, turn with much less than 7 grains. A balance has been made of such nice sensibility, that, when loaded at each end with 250 pounds, it turned with one grain.*

As to the substance of which the tube consists, this necessarily requires two qualities amongst others: 1st, impermeability to air; 2d, the power of resisting the chemical action of mercury. Glass combines both of these qualities, and the only objection to it is, its liability to fracture when boiling the mercury—of the metals, only two, so far as I am aware, are not acted on chemically by mercury—namely, iron and platinum. The former Mr. T. has shown to be objectionable, not being air tight. How is the latter circumstanced in this respect? If some of the other metals are impermeable to air, would it not suit to plate with the most eligible one so much of the tube as will not dip into the cistern?

I proceed to mention what appear improvements on the plan as originally proposed—1st. *With respect to the register apparatus.*—It is advisable to remove the counterpoise weights UUU (Madras Journal

* This balance was constructed on the plan and under the direction of the late Captain Kater, V.P.R.S. for verifying the national standard bushel—vide Phil. Trans. 1826.

No. 14, plate 15), from the pencil rod, because as the beam in rising above the horizontal or going below it, describes an arc, this rod with its weights, is moved more or less from the perpendicular, when both will have a tendency to bear on one of the guide rods YY. Supposing therefore the rod *f s* to terminate at the scale pan T, the register apparatus below may be moved further to the right. From this the pencil rod may rise to the beam, which of course must be prolonged, in order that the points on which the rod bears may be perpendicular above the register roller. The disadvantage of the pencil rod deviating from the perpendicular still remains in this arrangement:—but the end of a beam two feet in length, moving two inches upwards or downwards, deviates from the perpendicular only about quarter of an inch. Further, in the tropics the ordinary range of the barometer rarely exceeds a quarter of an inch (Daniell on Meteorological Essays), and during the storm that occurred at Madras 30th October 1836, which must be considered as an extreme case, the range of the barometer (as observed at the Madras Observatory, and recorded Madras Journal No. 14, p. 211) was only 1.135 inch; now, as the pencil rod will be very light, it is possible that the deviation under consideration, may occasion so very little difference between its absolute weight and its weight as bearing on the beam, that the objection thence arising may be more a theoretical than a practical one. It may, however, should the latter obtain, be completely avoided by placing an arc at the elongated end of the beam, the radius of which is the distance between it and the edge on which the balance turns. The pencil rod may be attached to this arc by means of a piece of platinum wire fixed to the top of the latter, which is of such fineness, that, while sufficiently strong to support the pencil rod, it is so flexible as accurately to adapt itself to the arc. It is evident that by this means the pencil rod will be moved up and down perpendicularly, as it will always be a tangent to the arc when this moves. If the arc be a perfect segment of a circle, the weight of the pencil rod will act with a uniform power on the balance, which of course it will not do if the arc be not such a perfect segment—and as there may be some difficulty in making this, it becomes a question, which of these two modes of attaching the pencil rod to the beam is the less objectionable. Should both be found practically defective, the pencil rod may be laid aside altogether, and the Mordan pencil furnished with its delicate spring, as mentioned in the original plan, be attached direct to the end of the beam at right angles to this. Thus situated, however, the pencil will require a plane surface on which to make the register, for in the case of the cylinder the pencil is a tangent to it only in a straight line, while the pencil, in the position stated, will describe an arc, as the beam moves up and down—consequently the hour lines instead of being straight as in the cylinder, must on this plane surface be seg-

ments of a circle, of which the radius is the length between the pencil and fulcrum of the beam. Further, while retained perpendicularly it will require to be moved horizontally, either towards the balance or from it, according as the hour lines are numbered from the right or left side of the plane. The clock-work that (as in the cylinder) gives motion to the plane, must be moved up towards the pencil end of the balance. The plane surface will best consist of glass, which when slightly ground (or frosted) with fine emery, will easily receive the pencil trace. It has the very great advantage of being little affected by heat or moisture, while the hour and horizontal lines may be drawn on the side opposite the one on which the pencil plays, so that this has a smooth surface on which to traverse, whereby the obstruction that might arise from those lines is avoided. From these planes it will be easy to read off to any degree of minuteness the pencil trace by means of a T ruler, the perpendicular limb of which will require to be graduated and furnished with a moveable vernier.

2d. *With respect to the lower portion of the tube.*—It was originally intended to make this sufficiently thick to displace the quantity of mercury necessary to balance that added to the length of the mercurial column by atmospheric pressure—instead of retaining so much solid iron, it is preferable to have a hollow cup of uniform area, and as the bulk of this that will enter the cistern will very nearly equal the bulk of mercury removed, very little alteration in the height of the latter in the cistern will occur. The cistern therefore need be no larger than will admit of the tube to move clear of it, and would best be of an oblong form as the horizontal motion of the tube, that, namely, occasioned by the beam describing an arc, is only in one direction. In the balance barometer the expanded bore at top is only of such length as to meet variations of atmospherical pressure accruing at any place, where the instrument is put in operation, and not for difference of *relative height of situation*—thus if the enlarged bore at top be only four inches long, it is evident that, at an elevation of about 4,000 feet, the mercury will have descended out of it—either the tube must be lowered or the cistern raised. This adjustment can easily be made by means of a screw—however, as a great portion of a tube that would suit at the level of the sea, must for an elevation of 6,000 or more feet be immersed in the cistern, this latter would require to be proportionally deep: by having tubes of different lengths, this increased depth might be avoided.

3d. *With respect to the magnifying the indications*—In addition to the mode mentioned in the description of the plan for this purpose, another suggests itself from what has been mentioned above respecting

the principle of specific gravity. This latter mode, which has the very great advantage of not losing power, consists in so proportioning the thickness of tube or size of cup in the cistern to the quantity of mercury added to the column by atmospheric pressure, that the tube can be moved by a small increase of column to any length required. In the case of a tube of uniform bore throughout (where no additional weight of mercury is added by moving the tube downwards), it is obvious that the thinner the lower end of the tube is, a proportionally greater length of it must dip into the mercury in the cistern, before a volume of mercury is displaced equal to what has entered the tube. But, in the case of the tube with expanded bore at top, it is evident that after atmospheric pressure has produced its full effect in increasing the weight of the mercurial column, further weight is added *merely by the continued depression of the tube*—because this depression magnifies, according to the length of it, an equal extent of the *small area* of narrow portion of the mercurial column to the large area of expanded top. This will appear evident on referring to Mr. Taylor's second diagram, in which if *c c* represented the bottom of the expanded portion before the tube be moved down, the upper portion of the narrow column *d* will after the tube descends be magnified to *c c*.

With respect to the expanded tube, therefore, when it is wished to magnify the indications, the increased weight of mercury occasioned by a given atmospherical pressure, must be added to the weight occasioned by the descent of the tube to the extent of the enlarged indication wanted, and the area of the float made of such size as the product of it into the length of the enlarged indication will equal the sum of the bulks of the two weights of mercury just named. Suppose it is desired to magnify the indications five times—expanded upper portion of tube being two inches square, small bore of tube one-tenth of an inch square. Here, for $\frac{1}{10}$ of an inch of rise of mercurial column, the tube must descend $\frac{1}{2}$ inch; taking the cubic inch of mercury to weigh 3434,

Then one cubic inch (= $\frac{1}{2}$ of 2 cubic inches)	=	3434
From which deduct weight of mercury already in bore = $\frac{1}{10}$ inch area $\frac{1}{2}$ inch long.		17.17
Weight of mercury added by $\frac{1}{2}$ inch depression of tube.	=	3416.83
$\frac{2}{10}$ of one cubic inch (= $\frac{1}{10}$ of two cubic inches) added by atmospheric pressure.		686.8
Sum of weight of mercury added by pressure and depression	=	4103.63 grains.

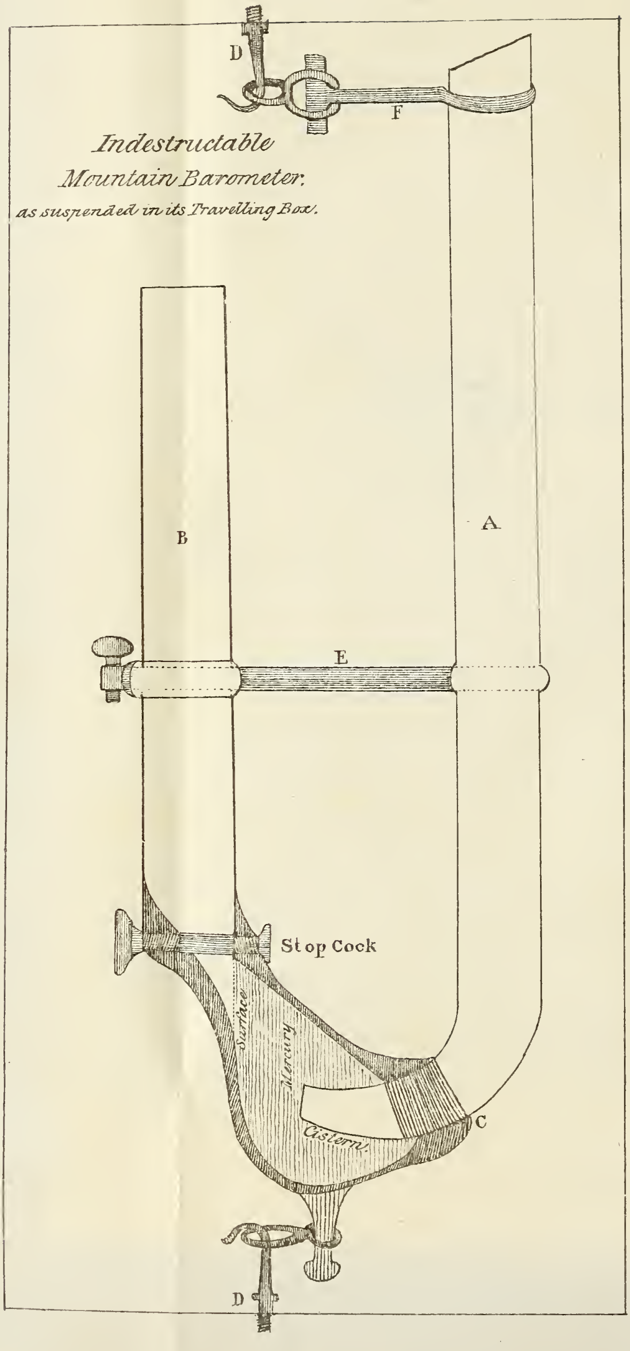
Then $\frac{\frac{1}{2} \text{ cub. inch mer.}}{1717} : 4103.63 :: \frac{\text{area sq. inch}}{1} : \frac{4103.63}{1717} =$ 2.39 square inches the area of the float. A correction is of course required for the thickness and specific gravity of the substance of the cup float. In an

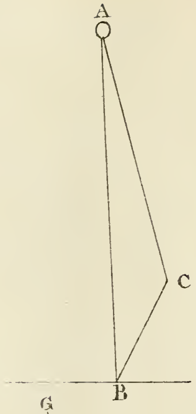
instrument such as the present, where practical construction may not have the correctness of its theoretical one, it would appear that the more accurate way of dividing the scale will be to do so from the indications of a standard barometer of common construction.

In the case of the cup float there will be a tendency to move the tube from the perpendicular, in consequence of the lower portion of the tube being so much lighter than the upper. This tendency, however, is easily prevented by lowering the centre of gravity of the tube, for which purpose two rods attached to the tube may descend outside the cistern to a convenient distance below it, to support a disc on which a weight may be placed. This weight will if sufficiently heavy bring the centre of gravity of the tube completely below the cup float. Indeed, if this float be sufficiently large to buoy up the tube, the balance part of the apparatus may be laid aside altogether, and the weight below the cistern, acting on the principle of ballast, will preserve the tube in the perpendicular. In order to keep the tube steady it would be necessary to have guides on either side of the tube—the pencil can be attached to any part of it, and made to bear directly on the register roller, which, as the tube moves perpendicularly, may be made in the manner described in the original plan, and in order to admit of the indications being magnified, the upper part of the float can be contracted.

Respecting form No. 2, (Fig. 1st, plate 15, Journal No. 14) the imperfection Mr. Taylor has pointed out as to the impossibility of knowing whether " air does not exist in the quicksilver between *e* and *c*," is certainly a very serious one and indeed applies not only to the part E C but to the entire tube, since the possessor of such an instrument would not, as in the glass tube, have the advantage of ocular demonstration as to the presence of air ; but would be left in doubt on this essential point. Presuming that the objection to iron will be got over by stating it as above mentioned, the following arrangement appears to remove the imperfection under consideration. Let the end C of the metallic tube *rise* into the middle of a cistern, after the manner that the glass tube of the Englefield barometer *descends* in the iron cistern—so that in what position soever the instrument be held the termination of the tube will always be immersed in mercury. On the top of this cistern let there be a stop-cock from which rises the glass short limb—lastly, let a screw enter one side of the cistern, which, when screwed home, will occupy a considerable portion of its area. Suppose now the entire long limb filled with mercury, the stop-cock K turned to prevent its return, also the cistern (the screw being out as far as possible) filled with mercury. Let now the glass limb be attached, and the cistern screw screwed home. Mercury will now stand in the glass tube at a given height—which ought to be engraved on the instrument.

[illegible]


Indestructable
Mountain Barometer,
as suspended in its Travelling Box.
D
F
B
A
E
Stop Cock
Surface
Mercury
Cistern
C
D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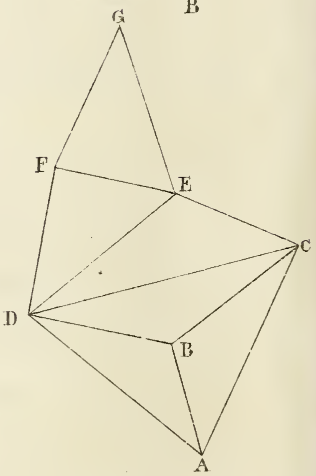
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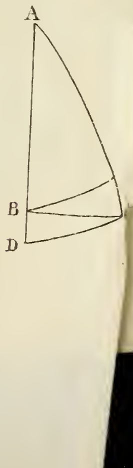
A
B
D

Now, presuming the instrument-maker has thoroughly expelled the air on first filling the instrument, all that the possessor would require to do in order to satisfy himself as to the pressure of air in any portion of the tube, would be to incline it in order to fill the long limb, turn the stop-cock *k* and screw home the cistern screw. If the mercury now stands at the height mentioned on the instrument, it of course must be as perfect as when it left the maker. The long limb ought to be sufficiently capacious to contain all the mercury in the glass limb, and part of that in the cistern, so that when the stop-cock above the latter is closed, there will be as much air in the cistern as will allow space for the expansion of the quicksilver in the whole tube, while this air is prevented entering the long limb, as the end of this will always be immersed in mercury. A simpler form than the above would consist in adopting that of the Englefield barometer, with the addition of a short glass limb rising out of the cistern, the long limb having expanded top, to contain the mercury in the short one, and part of that in the cistern as above mentioned. If this arrangement were applied to M. Gay Lussac's barometer, the possibility of air entering the long limb would be much more likely to be prevented than by the inverted cone, which after all, does not prevent the entrance of air, but merely confines what may have got into the lower part of the mercurial column. The instrument also might be carried in any position, which at present it does not admit of without the danger of air entering.

VI.—*Further Remarks regarding a Plan for an Indestructable Barometer.—By Captain* GEORGE UNDERWOOD, *Madras Engineers.*

In the remarks of the Astronomer of Madras, respecting the Indestructable Barometer and Self-Registering Apparatus, recommended by Dr. Gilchrist, I observe that Mr. Taylor admits that an iron tube can be rendered air-tight by the application of caoutchouc varnish, but adds that this precaution was eventually of no avail on the application of fire, for the purpose of boiling the quicksilver in the tube. Now, since the mercury may be boiled in the tube *before* applying the varnish, I cannot understand why the iron should be condemned for the reason alluded to. True it is, that, with such a material, air bubbles cannot be discerned, and with any opaque substance the liability to error is vastly greater on that account, if some means cannot be adopted for ascertaining the existence of so much air as shall vitiate the observations. However, in furtherance of some hasty and brief recommendations which I ventured to forward to the Journal on the subject

of an indestructable and self-registering barometer, as iron was likewise mentioned by myself, I trust I may be pardoned for throwing out the following suggestions, although I am not certain that Mr. Taylor commented at all on the plan proposed by me, since " No. 2" merely is mentioned, without names being specified. The approval which that scientific gentleman bestows on the self-registering apparatus of No. 2, (deeming it very well worthy of attention and likely to be adopted, if the difficulties before stated in the syphon tube can be obviated), as it works on the same *principle* as that proposed by myself, induces me to hope that something may be yet done to bring the matter to a successful issue. For observatories and fixed stations a syphon tube of glass, or semi-transparent porcelain (as suggested by a friend), will at once remove the objections justly stated by Mr. Taylor, and in my first letter this recommendation was accidentally omitted, for at that time my attention was more particularly turned to the rendering barometers, if possible, *indestructable*, and more useful to travellers. The drawing annexed, (Pl. 4. fig. 1.) will, I really think, serve to show that an iron syphon tube may be so constructed as to be easily filled and carried about without the chance of air getting either into the longer limb, or into any situation from which it will not be immediately expelled, when properly prepared for action—(vide figure and remarks). By tapping the barometer while horizontal before working it, the air bubbles will rise to the surface near the stop cock; for since the cistern was nearly full of mercury originally, no additional quantity of air can ever enter it, since the stop cock will be made mercury tight: the passage of air through it will be advantageous. There is room also for the mercury to expand in high temperatures, and after a journey, when the instrument is laid horizontally, trifling particles of air, which may adhere to the sides of the cistern, can be readily expelled by heating the screw end of the cistern after opening the stopper. It will be manifest, also, on inspection before placing the barometer vertically, whether much air has entered the instrument, for the mercury to allow of such occupation must necessarily have been *forced* through the stop cock or screw; but this seems an impossible case, while the air itself can be so much more easily pressed through those places.

From trials with an iron barometer in my possession, I think the long tube should be of one uniform bore throughout, and not larger at the vacuum end, as before recommended by me, unless made by the most careful and expert workman, since the difficulty of boring the latter, and the trouble of expelling air from it, become very great; while the scale also requires more than ordinary attention.

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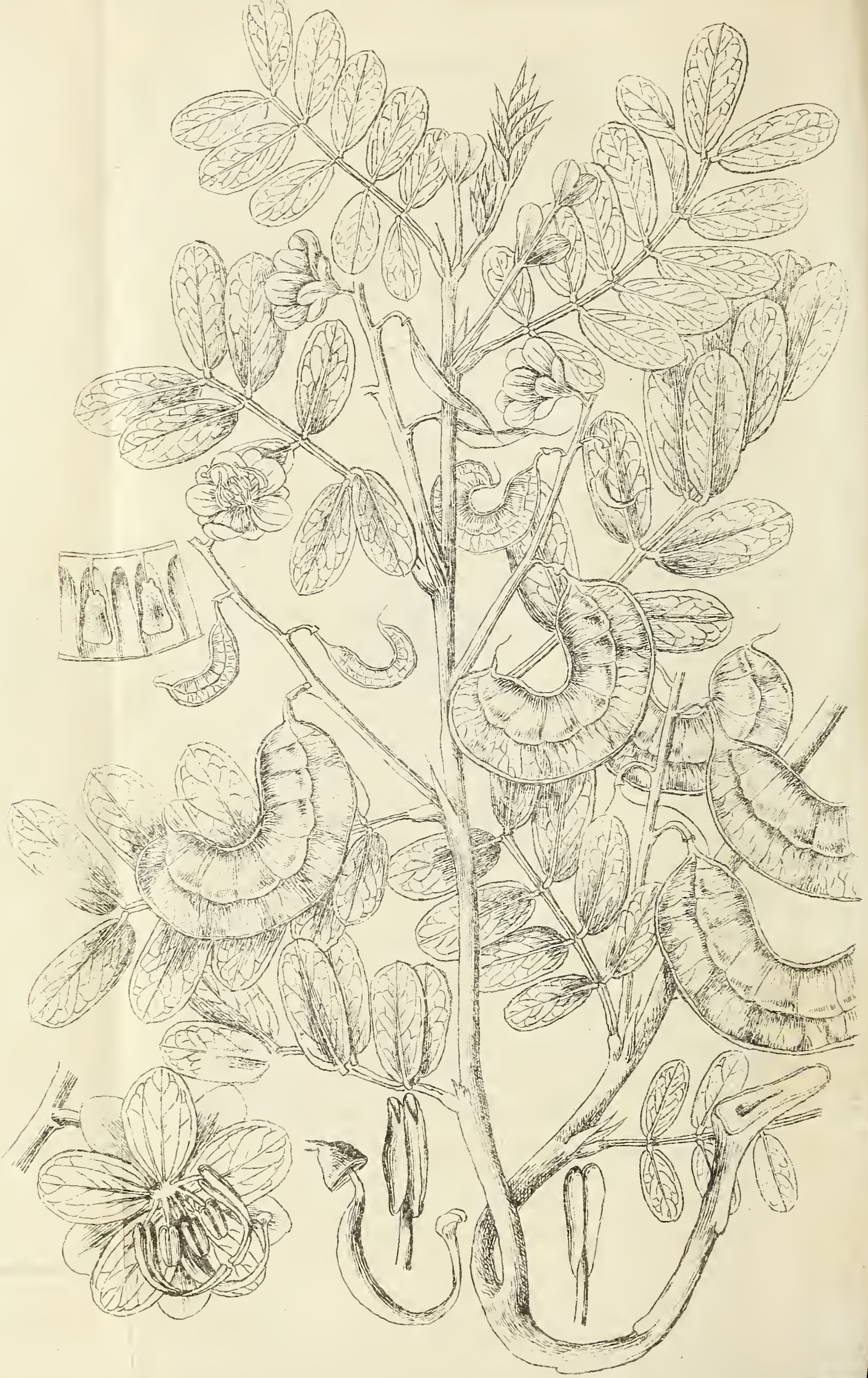
protection of a medical plant, permit me to offer a few



Rungia del. Cassia (Senna) Burmanni. Printed by Winch[illegible]

Remarks on the Figure.—The long limb A, is independent of the other, and the short tube B, with its cistern, stop cock, &c. screws on it at C. By this arrangement the long limb can be easily filled and the mercury boiled therein. When the short cistern limb is screwed on, while the other lays horizontally, mercury can be poured into the cistern to the level of the dotted line, and, from the peculiar shape thereof, the cistern will be as full as requisite, and very little air can remain in it on closing the stop cock. By inspection it will appear evident, that, turn the instrument as you will, the end of the long limb will be always immersed in mercury, and the contained air forced against the sides of the cistern. To keep the air in the cistern always in one part clear of the long or vacuum tube, if suspended in a box large enough to allow of its swinging freely on the hooks DD, no error will arise. The cistern end should always be carried uppermost in travelling or moving.

E. Iron bracket to support and steady the short limb.

F. A suspending iron and ring at the end of the long limb.

VII.—*Notice (with a plate) of the* CASSIA BURMANNI, *with Remarks on the Materia Medica of India.*—By ROBERT WIGHT, Esq. M. D., F. L. S.. *&c. Member of the Imp. Acad. Naturæ Curiosorum, Surgeon on the Madras Establishment.*

MADRAS, 20*th June*, 1837.

MY DEAR SIR,—At the close of my remarks on the cultivation of Senna, page 362 of your last Number, I mentioned an indigenous species possessing considerable medicinal properties, and added, that I should endeavour to procure specimens, from which to prepare a figure. I have now the pleasure to send you a drawing, rather too small to do justice to the subject, but so perfectly characteristic, so far as it goes, as to enable any one who may chance to meet with it to identify the plant---which is all that is wanted.

A recent notice in the public prints of a report by the 'Drug Committee' shows that it is the wish of government, to render this country as much as possible independent of foreign aid in the medical store department, by drawing on the resources of the country itself, for the supply of those medicinal agents required in the treatment of its more prevalent and dangerous forms of disease. As I have at different times paid a good deal of attention to medico-botanical subjects, you will, perhaps, under the protection of a medical plant, permit me to offer a few remarks applicable to the occasion of this paper, though less strictly

appertaining to the objects of the Madras Journal, than to one exclusively devoted to medicine.

The report, which appears to have for its object that of showing the course to be pursued in forming an Indian Pharmacopoeia, has not yet, so far as I have learned, reached Madras, and as the notice I have seen does not mention the measures which the Committee propose to pursue for the improvement and extension of our knowledge of that department, my remarks and suggestions will be entirely confined to it.

A cursory retrospect of the history of Materia Medica is sufficient to satisfy any one, however slightly conversant with the subject, that to complete a work of the kind contemplated by the Committee, of even moderate pretensions, is a task of great difficulty, owing to the many sources of error by which it is beset; and such a work can only be raised to the first rank, by the slow accumulation of experience, resulting from repeated experiment and observation, carefully distinguishing, at every step, between the jarring coincidences of *post hoc* and *propter hoc*: the result of which, in many instances, will be, to discard, as inert, medicines which have long enjoyed unmerited reputation, the removal of each of which must be esteemed an advance towards perfection.

The Hindoo Materia Medica, like that of all other nations but little advanced in civilization, is no doubt loaded with many such unworthy articles, but probably not much more so than those of Europe were two centuries ago; of these some may at once be struck out; others, however, can only be removed by the tedious process above specified. On the other hand it embraces many medicines of vast activity, but with whose powers, and the methods of administration best suited to elicit them, we are yet comparatively unacquainted. To detect error in the one case, and to ascertain the existence of valuable properties in the other, the same course must be followed, and not by one man, or in one place, but by many, and in different situations, each, moreover, making sure that he is experimenting on the same plant.

This last precaution is of greater importance than some might suppose. I have repeatedly had wrong plants brought to me, when I had no other means of making known the one wanted, than by reference to the native name assigned in Ainslie's Catalogue, and I have also seen two persons sent in different directions for the same plant, bring different ones, each insisting that his was the true one, and some times both at variance with the systematic name given as the synonym. I know an instance where a gentleman experimented most perseveringly with the common physic-nut (*Jatrophacurcas*) on the supposition that it was the true Croton tiglium, being brought to him by his dresser as the plant so named in Ainslie's Materia Medica. The very same thing happened to myself and on the same authority; I simply put the book into my native dresser's hand, made him read the name, and asked him

if he knew the plant—" yes, plenty grow here," was the reply, and the one brought was, as in the above instance, the *Jatropha.* I fortunately knew the difference, and was saved the trouble and disappointment of prescribing grain doses of a medicine that may be taken in half drachm ones, or many seeds, even, be eaten with impunity, provided the embryo, in which their activity is concentrated, be carefully removed. The fact here stated, will no doubt account for some of the very contradictory statements we occasionally hear from practitioners, who have been separately using, as they supposed, the same medicine, one declaring it of great activity, while the other maintains that it is perfectly inert, or at least that its activity is far below what other accounts gave him reason to expect. Such then is the present state of Indian Medical botany, and so long as this kind of uncertainty attaches to the investigations of those who endeavour to raise it to a higher rank in science, by carefully conducted experiment and observation, it is next to impossible that they can succeed, or that it can ever advance to that degree of perfection which it is now the anxious wish of the supreme government it should attain, and might under proper management be made to attain.

Our present knowledge of Indian medical plants is principally derived from the works of Drs. Fleming and Ainslie. These, for the most part, are little more than mere catalogues of native names of plants, with the botanical ones, so far as the authors had the means of ascertaining them, attached, but generally without descriptions, and in no instance with figures of the plants referred to, by which a person unacquainted with botany could ascertain the identity of specimens supplied by a native druggist, with the plant named in the catalogue ; and, for want of plates, these, in all other respects valuable, works, to this day remain almost a dead letter. They, it is true, refer to works where botanical characters, and sometimes plates, are to be found, but the books so quoted are in few hands, some of them of great rarity, or so costly and bulky that few can afford to purchase them, or if they did, could conveniently carry them on a march : while Willdenow's *Species Plantarum,* in nearly all cases the leading authority, requires, on the part of the person consulting it, a proficiency in botany, to make out a plant from his brief characters, not easily acquired, and which few obtain.

When these authors published, such was the backward state of the arts in India, that, had they wished it, they could scarcely at any cost, short of sending their drawing to England to be engraved, have illustrated their works with figures of the plants named. Times are now greatly altered : the discovery of lithography, and its application to the representation of objects of natural history, has effected this

change : now, as the accompanying figure proves, we may even have good coloured representations, and, I believe, at an expense little if at all exceeding what similar ones would cost in England ; say, for quarto sized coloured plates, about 30 or 35 Rupees the hundred, and executed in simple outline, in the manner of those I have already published in the Journal, for less than half the sum.* We may now therefore fairly assume, that, under the double advantage of enjoying the fostering aid of the Supreme Government, and profiting by the flood of light which the unceasing labours of vegetable physiologists has of late years cast on the relationship existing between the natural affinities, botanically considered, and the active properties of plants, the time has arrived for making a rapid advance in this important department of medicine. With these collateral aids, little more is required than industry and judgment on the part of the compiler, to lay the foundation of a local medical botany as perfect as any yet extant. That sufficient materials for such a work are already in existence, I think I may with confidence assume, from having myself, with but little care, collected a considerable store, with the intention of undertaking the work on my own responsibility, should circumstances favourable to its prosecution occur. These it has not yet fallen to my lot to enjoy ; and, hitherto, the only advantage I have reaped in return for a heavy expenditure, has been some experience of the manner in which, I think, it should be executed.

It only remains for me to add, as the deduction from the preceding observations, that I consider it next to impossible, without the aid of pictorial illustrations, to make any considerable progress in the knowledge of Indian Medical Botany, and that as these could now be supplied at very moderate cost, the subject seems to be one meriting the attention of government. For myself I am so thoroughly satisfied of the utility, or rather the absolute necessity, of plates, towards aiding the investigations of the naturalist, and more especially those of the tyro in natural history, that I consider it almost a duty to publish, so soon as circumstances will permit, a series of figures representing one or more species of each of the natural orders defined in my peninsular flora, with the view of facilitating the researches of those who (perhaps for the first time) have given their attention to that method of arrangement since the publication of that work. The principal obstacle to be sur-

* This is cheaper than the Monthly botanical periodicals. The Botanical Magazine, the cheapest of these, charges at the rate of £4 0 4 per 100 4to. plates with letter press descriptions to each, and has a circulation of about 1400 copies. On so large an impression the cost of copper-plates and printing scarce exceeds a half-penny for each impression the principal outlay therefore is the colouring and paper, which cannot be lessened by repetition.

mounted, in embarking on such publications, is the expense necessarily incurred before any return can be expected; and then the uncertainty of finding a demand for such costly works, sufficient to indemnify the publisher for his risk and first heavy outlay. Whether it will be possible to overcome these impediments in Madras I have yet to learn, but enquiry is now on foot, and if I find that it can be 'got up' at so cheap a rate as to secure for itself, such a sale as will nearly cover the cost, I shall be happy to avail myself of the issue of your next number to make known the plan, and exhibit a specimen of the work, by the publication of a prospectus, and in the mean time, if any among your readers are desirous of encouraging the undertaking, they, by making their wishes known, may greatly contribute towards having them gratified, as the names of even a few unexpected subscribers may go far in determining the course I shall pursue. Apologising for the unexpected length to which this letter has extended,

I remain, dear sir,

Yours ever faithfully,

To ROBERT WIGHT.

ROBERT COLE, *Esquire, &c. &c. &c.*

VIII.—*On the Structure and Habits of the Elanus Melanopterus.*— *By* B. H. HODGSON, Esq. *British Resident in Nipal.*

TO THE EDITOR OF THE MADRAS JOURNAL.

SIR,---The following details relative to the structure and habits of Elanus Melanopterus will prove interesting to all persons engaged in the noble attempt to classify birds according to their natural affinities, or, in other words, according to their essential conformation and manners.

Whether this attempt will *succeed* in the hands of such as, for the most part, have no adequate means of knowing more of habits and economy, than can be gleaned from the random notices of merely casual observers, nor any more of structure than can be elaborated from dry skins, remains to be seen. But I return to my subject.

MILVINÆ.

Genus. ELANUS.

Species. ELANUS MELANOPTERUS.

The *Chanwa* and *Chanwa Musaher* of Hindosthan.

Form. The female is 13 inches long, by 35 in expanse of wings, and $8\frac{1}{2}$ oz. in weight. The male is about 1 inch smaller, and seldom weighs above $7\frac{1}{2}$ oz. Both have the same aspect. The following is a detail of the dimensions of a male:—

		inches.	*parts.*
Tip bill to tip tail		12	$\frac{1}{2}$
Bill, length, from gape		1	$\frac{1}{16}$
Bill, length, from brows		0	$\frac{13}{16}$
Bill, basal height		0	$\frac{10}{16}$
Bill, basal width		0	$\frac{15}{16}$
Length of tail		5	$\frac{1}{8}$
Expanse of wings		34	0
Length of a closed wing		10	$\frac{1}{2}$
Length of tarsus, to sole		1	$\frac{7}{16}$
Length of central toe	exclusive of talons.	1	$\frac{2}{16}$
Length of inner fore toe	exclusive of talons.	0	$\frac{13}{16}$
Length of outer fore toe	exclusive of talons.	0	$\frac{11}{16}$
Length of hind toe		0	$\frac{9}{16}$
Length of hind talon (straight)		0	$\frac{11}{16}$

The bill, from the gape, is as long as the head, that is, actually long: but from the brow it is more distinctly *short:* a peculiarity caused by the width of the mouth and by the advanced position of the frontal plumes. Both the bill and the head, from the nares to the occiput, are distinguished by great breadth; but the bill, before the nares, is much compressed and feeble. The bill is slightly curved from the base; its hook is long and sharp; its upper mandible has a conspicuous accipitrine festoon; and its lower one is rather abruptly truncated but not notched. The cere is of mean size, and is nearly hid by soft curling hairs which radiate from the four angle of the eyes and clothe the lores an d orbits : the nostrils are oval, longitudinal, lateral, with a full and free membranous edge on the upper margin. The eye is large and is furnished with a conspicuous salient opercule. The wings are very ample, and usually exceed the tail by $1\frac{1}{2}$ inch. Next to their length, their chief feature is the breadth and softness of the webs or vanes of the feathers. The second quill is invariably the longest; and the third is longer than the first, the former being about $\frac{3}{8}$, and the latter $\frac{5}{8}$, of an inch less than the second. The primes exceed the tertials by more than a third of the entire length of the former. The

first quill is moderately notched on the inner vane, about $1\frac{1}{2}$ inch from its point: but the notch is less strong and more remote than in Falco. The scapulars are usually about $1\frac{1}{2}$ inch shorter than the tertials. The tail is short, and, like the wings, noticeably soft, as is, indeed, the *whole plumage*. The tail is, upon the whole, nearly even; but there is a slight gradation from below in the extreme lateral feathers, and another from the centre above. The latter seldom exceeds half an inch, but still the tail may be said to be somewhat forked, though there be scarcely a trace of the divaricating structure, even in the extreme feathers. Shortness and thickness are the characteristics of the legs and feet: but the thickness is of that sort which the vulgar call 'gumminess'—not nervous strength. The tarsi are half plumed in front; their residue, and the toes, being very finely reticulated, with the exception of three digital scales next to each talon. The toes are short, unequal, and cleft, but the outer one, though free, can only act in front. The chief feature of the digits is the excess in length of the inner over the outer fore one. The central one has the average superiority over the others in length; and the hind one is just half as long as the central, or somewhat short but broad and stout. All the digits have nearly the same thickness. The soles of the feet are full and rounded, soft and unballed. The talons are sufficiently large, strong and acute; the inner and hind being equal; the central as long almost but feebler; and the outer fore, much the smallest. All the talons are rounded below, but none of them are compressed.

The ear, as well as the eye, is very noticeably large; and the gape reaches to the centre of the eye or more. The breadth of the head, and of the bill near it, have been already noticed; and these features, together with the amplitude of the wings, and the shortness of the tail and feet, seem to indicate (in the language of Mr. Swainson) a Natatorial or Fissirostral type. And, as there cannot, I suppose be *two* such types in the circle of the Milvinæ, it is difficult to imagine how Nauclerus and Elanus can continue distinct in this single circle.

But what the manners of Elanus? The birds of this genus are not, in India, migratory: they breed on (not in) trees, laying usually from 3 to 5 eggs in April, May, and rearing commonly from 3 to 4 young. The Chanwa or black wing quests chiefly in the morning and evening, feeding upon small birds, insects and mice. It does not usually seize upon the wing, though its hunting be, for the most part, by continuous questing. Commonly it is seen skimming the cultivation, like a Circus, occasionally poising itself on the wing for the purpose of getting a distincter view of some mouse, small bird or insect which has stirred on its beat and upon which, when clearly perceived, it stoops perpendicularly with the speed of lightning. After a while, it will resort to

some low roost, and, when relieved, commence another excursion, or perchance sit and watch there for its prey. Its forward flight is easy, low, and silent, but very effective in evolution when exertion is required to capture such nimble game as mice, which constitute its ordinary food.

It frequently whips off insects from the stalks of standing grain, after the manner of the Brahmani Cheel or Haliœtus (!) Pondicerianus; and this feat is, of course, accomplished on the *wing*. I have also seen the Chanwa pursue cuckoos and sparrows with uncommon energy, but I never witnessed it strike a *bird* in the air. Like the type of Circus, however, the Chanwa doubtless *can*, and sometimes does, seize its feathered prey on the wing. So that its manners are, upon the whole, sufficiently Fissirostral: perhaps as much so as its Raptorial affinities will admit of. Analogies and affinities are very fine abstract terms, which the quiet Orientals would be puzzled to deal with. But, as these words really import no more than remote and near resemblance of form and habits, one can hardly resist the presumption that (strongly as *habits illustrate form*), so observant and ancient a people as the Indians have probably reached some general conclusions as to the true relations of the animate beings of their own country, such as may be, oft-times, more worthy of a philosophical attention than the conclusions upon the same matters that have been elaborated in Europe out of *dry skins*, by dint of inference from structure *so seen*, to habits *wholly unknown*.

Now, it is remarkable enough that the people have, for ages past, been wont to approximate the Elani to the Harriers, but still without confounding the two. Is there any warrant for this approximation? It would seem so: for, both are twilight questers, flying in the same manner and seeking the same prey (mice). Both have large eyes and ears, soft plumage, long wings, wide gapes, large nostrils nearly hid by radiating hairs, bills much compressed and feeble before the cere, but furnished with a long sharp hook and an accipitrine festoon. In several of these common attributes there is an equal and conspicuous tendency towards the Strigine model, which tendency seems to give fresh authority to that approximation of the two groups to *each other*, so long familiar to the people of India, though but yesterday, and still dimly, perceived by the towering ken of European science!

IX.—*Remarks on the Cultivation of Cotton; principally with reference to the finer Foreign Varieties.—By* ROBERT WIGHT, Esq., M. D. *&c. &c. &c.*

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The very general failure of nearly all the attempts made in 1832-3 to introduce the cultivation of American and Bourbon cotton into the Peninsula, partly owing to unfavourable seasons, partly to the bad quality of the seed, and not unfrequently from the improper selection of soils on which to sow, induced me to call the attention of the Agricultural Society to the subject at its last meeting. I was in consequence requested by it, to draw up for circulation, in connection with its late liberal distribution of foreign seeds, such instructions for their management as I might think would tend to secure greater success to the attempts now making. In compliance with this request, I have selected the following remarks from materials collected for a more general report on the subject, and trust that they will prove the means of preventing disappointment in some cases, and securing success in others. They divide themselves into two parts or sections, namely, first, an abstract of the most improved methods of culture as now practised, and secondly, suggestions for an experimental enquiry, which I think might be undertaken with a fair prospect of success, and the chance of introducing very great improvements, as I feel quite satisfied that in India we are yet far from having arrived at perfection in this branch of Agriculture.

With reference to the second section I invite communications, and to those who, so far go along with me as either to repeat the experiments I have now in progress, or who, acting on the same idea, think they can more advantageously arrive at the result, though by a somewhat different route, I will feel thankful for any information their enquiries may elicit.

With respect to the seeds either already distributed or in course of distribution, I have ascertained that, with the exception of the Egyptian, the Sea Island of 1836, and New Orleans of 1837 all are, upon the whole, good; the Bourbon, and the Sea Island of 1837, excellent. An easy and economical way of ascertaining their qualities is to soak a few from 10 to 12 hours in water, and then sow them in slightly shaded beds or boxes of loose moist earth: if good, they will generally begin to show themselves in three or four days after sowing. Those covered with a thick coat of fur are a little longer.

In the cultivation of Sea Island considerable attention to the soil and situation seems indispensable. Mr. Piddington in his paper on soils, has shown that a large percentage of calcarious matter is nearly essential to a good cotton soil, a result that corresponds exactly with the following account of the soil of the Sea islands, extracted from Dr. Ure's work on the Cotton Manufacture, vol. 1, page 101. "There is a long range of Islands lying between George Town in South Carolina, and St. Mary's in Georgia which extends from 32° 30′ to 30° of north latitude, through a space of 200 miles. These Islands were originally covered with live oak, and the other evergreens of a southern climate; they had been the abode of a particular tribe of the red men of the west, who were fishermen rather than hunters: the accumulatian of oysters, clambs, and other kinds of shells, mingled with the remains of the bones and pottery of the ancient Aborigines, is so vast as to fill every stranger with astonishment; and these calcarious matters had become intimately mixed with the sandy soil and decayed vegetables into a peculiar loam, of a light and fertile nature. A former colony of English settlers had made the shores of these islands the seat of some indigo plantations. It was upon two of these islets, separated from the continent by a few miles of grassy salt marsh, that the Sea-island cotton was first made to grow." Again, page 102 "It is within the district from St. Mary's in Georgia to George Town in South Carolina, extending not more than 15 miles inland, that the Sea-island cotton is still confined. Whenever its cultivation has been attempted, to the North, South or West, beyond these limits, a certain decline in its quality has been observed to take place." From this it would appear that the light coast soils are the most appropriate for this sort, and will be still better, when, from the vicinity of deposits of shells, copious supplies of calcarious matter can be had for manure.

The Upland Georgia, or short staple cotton, is not so exclusive in the selection of its soil, but it also prefers a loose grey or reddish, somewhat sandy loam, not liable to crack and gape during the hot season. This I consider of consequence, as I esteem it essential to success, in the cultivation of this variety in India, that we change the constitution of the plant from an annual to a perennial, or at least to a biennial, a change which the frosts of its native country prevent, but which we can have no difficulty in accomplishing, all that is required being, to cut down the plants after the crop is gathered, and allow the roots to lie dormant, until the setting in of the next rains revive them, when fresh ploughing and manuring will secure a second, and probably much better, crop than the first; such at least from analogy I judge will be the case. Some further remarks will be found on this subject in a subsequent page. Similar treatment I feel assured will convert our

annual into biennial, or perennial, shrubs,* if the hardening and cracking of the black clay soils in which they are grown do not prevent by too severely injuring the roots. But I rather think the annual character is mainly attributable to the stems being left vegetating after the crop is gathered, by which the strength of the root being exhausted through the constant and severe drain at the time it should be allowed to rest, it is no longer capable, on change of season, of producing a remunerating return, and is consequently extirpated to make way for a more profitable employment of the ground.

As in the cultivation of cotton the broadcast method of sowing is radically bad, advantage should be taken of the introduction of a new kind, to establish with respect to it, at whatever cost, drill husbandry, for if found advantageous, it will extend to the original country variety (which from the soil it affects can never be entirely superseded) and might be the means of enlarging and improving the produce. With this view the seeds should be sown in shallow furrows about 4 feet apart, and the plants afterwards thinned out to two or three feet distance from each other, according to the fertility of the soil and probable size of the bushes. Many advantages would result, the ground could be easily hoed and kept clean, and the crop gathered without injuring the bushes. If, as the natives almost invariably do, light crops are sown in the same field, they, by being also sown in rows, could be easily kept from injuring the cotton plants, either during their growth or while reaping them. The bushes would have room to grow to their full size, and produce individually much more cotton with less exhaustion to the soil. When well grown, say from two to three feet high, the ends of the branches should be lopped. This operation, by checking vegetation for a few days and allowing the plants some rest and time to harden their young wood, will be followed by a copious supply of new shoots, and, as they alone bear flowers, a greatly augmented crop. After the crop is gathered, vegetation should as much as possible be checked. The easiest way to effect this is to strip the bushes of their leaves, by eating them down with sheep or cattle, by which the ground is at the same time manured, and then cut down the stumps almost to the ground in imitation of the Persian method. The roots are thus saved from the exhausting efforts they otherwise make to support vegetation in the stem during an unfavourable season, after the previous exertion of maturing a crop. In this way they may last many years, and allow

* "The shrub cultivated as an annual at Malta, under the incorrect title of *Gossypium herbaceum*, may under certain circumstances last for several years. Thus the cotton-growers at Motril in Spain raised many of their cotton plantations from Maltese seeds, and yet they found the shrubs live for six or even ten years. This change of the longevity of the plant is partly due to husbandry and partly to climate." *Ure. vol.* 1, *p.* 58-59.

besides a good crop of grain to be reaped annually from the same ground.

With respect to cleaning, it may be observed that the long staple cottons are easily separated from the seeds usually, and it is best done by the roller machine, which does not injure its delicate fibres. The short staples, on the contrary, are very difficult to clean, and for them the saw gin will be found by far the most economical method of proceeding, their fibres being so strong as not to suffer, or but slightly, from its rough operation. Our country white cottons, especially the finer sorts, are allied to the long staples, and like them are seriously injured by the saw. The nankin or red cotton, a short staple, and perhaps some of the coarser whites, will bear it well. For freeing fine Bourbon I would recommend caution in its application, as I think there is much reason to fear its doing harm, and if used at all, should have a slower motion than in cleaning short staples.

The following suggestions for an experimental enquiry having been written before these memoranda were even thought of, will account for the occasional repetitions which I have not thought necessary to change.

An opinion has long prevailed among cotton cultivators, that the plant must not be removed from the spot on which the seed germinated, nor even the soil be hoed or loosened to such a depth as to injure or interfere with its delicate fibrous roots, under the supposition that such removal or injury will certainly destroy the plant. This opinion being contrary to all analogy with the rest of the vegetable kingdom, and at variance with some well known facts, such as the ploughing of cotton fields when the plant is a month old, to clean the ground and thin out the superfluous plants, currently practised in this country, it is desirable to ascertain whether or not it is altogether founded on speculation. As a question of vegetable physiology it is interesting, but, in an agricultural point of view, it becomes one of great importance, especially to this country, where the cotton cultivation is so dependent on the regular periodical changes of the monsoons, as materially to interfere with any deviations from the usual routine of culture we may wish to adopt not having reference to these changes.

For example, the seed is usually sown after the first burst of the monsoon is over, and long before the plants are full grown the dry weather has commenced, and is far advanced when the crop time arrives, whence, owing to the previous operation of protracted drought and heat, vegetation is arrested previous to the plants attaining their full size and strength, to resist the united influence of these agents. In this comparatively stationary condition they begin to blossom, and, there being no regular succession of new shoots to keep up the supply of flowers, soon cease bearing, and give but a small return for the pre-

vious outlay and labour bestowed on their culture. Could not the interference of art effect a beneficial alteration by so modifying the growth, as to allow the plants to attain greater maturity previous to flowering, thus fitting them longer to resist the drought and heat of the bearing season, and in an equal ratio increase the produce ?

If the opinion stated above be found correct in practice, the plan I am about to propose for the attainment of this object will fail, but not believing it well founded, or rather indeed knowing it to be erroneous, at the same time esteeming it a duty incumbent on us to endeavour by every means in our power to augment the produce of the soil, more especially by teaching the natives improved modes of agriculture, I can have no hesitation in recommending the method for trial ; the more so, as the requisite, trials to determine its value, may be made at a very small expense, and, if successfully, may with an inconsiderable increase of cost and labour lead to greatly augmented returns.

The prevalent practice in the cultivation of cotton is to prepare the ground by repeated ploughings after the first rains have loosened the surface, and wait for sowing, in some districts until the setting in of the petty monsoon in July, in others till October or November, when the first burst of the North East monsoon is past. From five to seven months after, the harvest begins, and lasts from one to two months.

With the view of ascertaining the relative advantages of late and early sowing, I constructed from the district reports the second column of the accompanying table, from which however no very satisfactory conclusion can be drawn, as the differences of seed-time seemingly depend on local variations of season in the different districts. In all, with the exception of Vizagapatam and perhaps Ganjam, the, in my opinion, objectionable system prevails, of allowing the plants to flower without a check before they have obtained sufficient maturity, or their roots have acquired that strength and diffusion, requisite to enable them to resist the drought of the dry season.

The method by which I propose to obviate this objection is the introduction of transplanting, a system so generally prevalent in native agriculture, and its advantages so well known, that it is not likely to meet frivolous or unsubstantial opposition.

In herbaceous vegetables " transplanting has the effect of increasing the proportion of fibrous relatively to their ramose roots, by which it is found to increase the size and succulency of their leaves, flowers and fruit." I anticipate other advantages. I think it will produce hardier and stronger plants by the check to vegetation which it will cause, allowing time for the first layer of wood to harden, and by conferring on the plants a somewhat biennial character, cause a larger formation of new shoots, on which the crop depends, and with them the produc-

tion of cotton at an earlier stage of the hot season (while the ground is yet moist), a prolonged harvest, and an augmented crop.

The plan I am pursuing, in a series of experiments undertaken with the view of determining the probable success of the method, is, that of sowing the seed in beds, from which they are afterwards to be transplanted into the open ground with the first favourable change of weather. In my experiments I fear it will turn out that the sowing was too early (end of March and beginning of April), and that the plants will have attained an inconvenient size before such a change can be anticipated, but I imagine from a month to six weeks old, will be found a good age for removal. In transplanting, one of two methods might be adopted, especially where the English plough is in use, namely, either by laying the plants in deep furrows (the root should be extended its full length) four feet apart, or by the holing system. The holes should be two or three feet distant and six or eight inches deep, equal to the full length of the root. In this way they would be planted regularly, and at such distances as to permit free access for weeding, hoeing and gathering, without injuring the bushes, while they would be prevented choaking each other, and injuriously exhausting the soil by being too thickly sown.

In most parts of the country it is the native practice to sow grain among the cotton plants, and it is said without injuring the cotton crop. Should this, on careful comparative trials, be found not injurious, the practice would be greatly facilitated by the transplanting system. Green crops of the larger kinds of dry grain might be very conveniently taken and dried, and stored like hay for provender ; the want of which in most cotton countries is much felt, while it is known that no kind of dry forage is more nutritious or more relished by cattle. The cotton itself might also be expected to prove better in quality, as well as more in quantity, from being the produce of vigorous and well matured plants.

These sanguine expectations are, it must be confessed, in a great degree, but not altogether, speculative, for in the Vizagapatam collectorate, where liberal pruning is practised, the return is much greater than in any other district. This operation acts much in the same way, by, in the first instance, checking vegetation, which is followed by the production of numerous new shoots and abundance of flowers. There the annual cotton plants, when about three months old, are freely pruned, while the bushes of the triennial sort are cut down nearly to the ground the second and third years, and the produce is said to amount to 46 maunds or 1150 lbs. of seed cotton per acre, nearly equal to the best, and exceeding the ordinary, American crops. In Ganjam the same course, though not stated, seems to be pursued, since the amount

of produce is the same,* though the soil is thought inferior, while in Trichinopoly, the next highest, with a fertile soil, 31 maunds 8 lbs., or 783 lbs., is the greatest return, which, though so much less than the above, is still more than double the average return from the neighbouring districts of Tanjore, Salem, Coimbatore, Madura and Tinnevelly. The agriculturul processes are not detailed. From N. Arcot, Bellary, and Cuddapah, the two last the principal cotton districts of the peninsula, no reports have yet been received.

A slight inspection of the table will show that, in selecting the time for entering on the experiments here proposed, we are not to be guided by the Calendar, but by the local variations of the seasons, the principal of them being, to have well grown plants ready to transplant at what is now the usual season of sowing, with the view of ensuring a continued production of new shoots and flowers through a period of several months, an effect, that will be still further secured by occasional topping the extreme branches during the operations of weeding and hoeing.

Hitherto I have supposed the annual varieties the ones under trial, though I consider the plan equally, or rather more applicable to the foreign sorts. But with respect to them something more may be done. In the districts where the Bourbon and American kinds are in cultivation, I would recommend that one or two fields, which have already produced their usual rotation, and are about to be ploughed up, should be opened to the grazing of cattle and sheep, and when they have taken all they can get from them, to have the woody stems cut down to the roots, the land well ploughed between the rows, and then left to produce a fresh crop of shoots on the return of the rains. The fourth crop of Bourbon cotton from the same roots is now usually considered scarcely worth the trouble of collection, and the American is cultivated as an annual, but might thus I apprehend be rendered biennial, or even perennial. In Persia we are told that the practice here recommended is annually practised, and that the same plants so treated, last many years (20 or 30), the land every season producing besides a crop of grain. If in this way we can get only one or two additional good crops from the same roots, a great saving would be effected, as it must cost much less to plough and manure the ground in this way, than to root out the old plants, allow it to lie fallow for a season, and then re-sow. The great size, and the depth to which the ramose roots must have previously penetrated, will have placed the greater part of them beyond the reach of injury from the plough, and the new fresh manured soil with which

* The collector has since informed me that this is a mistake, originating in the uncleaned or seed cotton having by an oversight been noted in the column for cleaned.

the more superficial series will be brought in contact, will draw from them an abundant supply of absorbing fibrous ones. The Persian practice seems to confirm the American belief, that cotton is not an exhausting crop, and that the rotation crop taken there every third year, is not so much to relieve the land as to prevent a disposition which cotton has to generate insects and blight, which in Persia the annual crop of grain seems to obviate.

It seems of importance to ascertain whether a practice such as here recommended can be introduced successfully, since it might be the means of establishing more extensively the method of pruning, which I have already shown to be so advantageously adopted in the Vizagapatam district, but which in other districts is scarcely if at all known, by proving to demonstration, that so far from being injurious to the plant, that it may be boldly cut down to the root with evident advantage. To this it may be added, that if the country cotton plant was so cut down after gathering the crop, and the roots relieved from the exhausting and destructive effort to support vegetation in the stems, at a most unfavourable season, that they might be made to produce a succession of remunerating crops, allowing the ground at the same time, to be as freely employed for the production of annual crops of grain, while the new stems of the cotton plant are growing, as if nothing else was there ; thereby, as has been done in Persia, Spain, Sicily and the Levant, in all of which, the same species seems to be the one cultivated, changing the constitution and habit of the plant from that of a small annual to a perennial.

In submitting these hints, with the view of requesting the aid of the Revenue Officers to carry into effect the required experiments to determine their value, it does not appear advisable that they should be undertaken on an expensive scale ; such a proceeding is not necessary to establish the principle if correct, and failure in such a case might be productive of serious injury, by discouraging further attempts at improvement.

The method I am pursuing is to sow samples of a variety of different kinds of seed (communicated by the Madras Agricultural Society) in beds eight or ten feet square. The plants, with the exception of a few to be left for comparison, will be planted out when the rains set in. In all other respects the usual methods of agriculture will be adopted, and the result carefully noted.

In preparing the seeds they were soaked in water ten or twelve hours previous to sowing, a proceeding which probably tended to make them vegetate quicker, but is not necessary. Of the kinds sown, were two samples of Sea Island, one received in 1836, the other 1837 ; the former entirely failed, while nearly every seed of the latter has vegetated : two samples of New Orleans marked 1836 and 1837 ; the latter

has entirely failed, the former succeeded: two samples of Upland Georgia, 1836 and 1837; the former has partially failed; one of Bourbon succeeded perfectly. One of Egyptian 1837, entirely failed; a few seeds of Egyptian, communicated by Mr. Liddell from plants raised in his garden, some with downy, others with smooth seeds, both have vegetated: a few seeds of Pernambuco (?) gathered by myself from a tree in Bangalore, all vegetated. These examples show that much disappointment may be prevented by thus testing all foreign supplies of seed, before sowing them on a large scale.

The soil in which they are sown is a light grey sandy loam, the soil in which they are afterwards to be planted is of the same kind. But, to do justice to such an experiment, different soils should be selected, not only for the different kinds, but for each kind, as some may succeed well in some soils and fail in others. It is already known that the Bourbon and American varieties thrive in red, sandy, calcarious, also in light sandy grey, and in alluvial, soils, but altogether fail in the black cotton soils, which the country variety prefers. The Sea Island and Upland Georgia have been successfully tried on the saline sandy soils of the coast, both at Bimlipatam and Ingeram (at the latter of which places, the Bourbon had previously signally failed), and produced an abundant crop of fine cotton. The coast soils generally contain a considerable admixture of calcarious and saline matter. Such are the soils of the Sea-Islands, and so tenacious is that kind of proximity to the coast, or as it is said in America of a " saline atmosphere," that much of its good qualities are lost by removal twenty or thirty miles inland. On such, therefore, our experiments ought to be most extensively (but not exclusively) tried, and such being in some degree the character of my garden soil, it is from that and the New Orleans I anticipate the greatest success. The Bourbon however also succeeds well in grey sandy soils, as I had an opportunity of observing at Bangalore, where it seems to thrive exceedingly well.

In conclusion, I beg to add that the experiments ought not to be exclusively under the management of Europeans, neither ought the poorer ryots to be called upon to take a share in them, unless ensured against loss, but as many as possible of the wealthy and intelligent native proprietors of every district, who can be made to understand the object and principle of them, should be invited to assist in them, as their (the native proprietors') success will prove a much more satisfactory standard of comparison and means of encouragement to the poorer classes, for whose benefit principally they are undertaken, than that of Europeans, however conclusive, and will tend much more to diffuse a knowledge of the plan, and its advantages, if any, by giving them constant opportunities of

examining the progress of the experiments in all their stages, and forming a correct estimate of the benefits likely to accrue. This they could not have, if confined to the gardens and compounds of Europeans. But they ought to be made simultaneously in both situations, for success in the one may demonstrate satisfactorily the causes of failure, should such happen, in the other, and suggest such repetitions and modifications in the successive steps of the experiments, as may finally lead to the most triumphant results, by eliciting information of the greatest value, towards improving both the quantity and quality of this most invaluable of vegetable productions.

There is another point of view, in which it is necessary to consider this proposal. One of the prominent defects of Indian agriculture is their neglecting to change the seed from time to time. Seed of the same stock is sown year after year on the same grounds, apparently in absolute ignorance of the advantages to be derived from change, and which is no where greater than in cotton cultivation; hence, we never hear of interchange of seed between different districts forming any part of the agricultural code of the Hindoos, but is one, which it is most desirable to establish, by proving experimentally its benefits. Spain, Italy, Sicily and Malta, each supplies itself with seed from its neighbour, and all benefit, though there is every reason to believe they were all supplied from the same original stock. Here it is probable the transplanting method will usefully come into play, for if finer and stronger plants are so reared, analogy teaches us that their seed will, even under the ordinary treatment, give a finer produce, and in this way advantage may be taken of the plan, intermediately, to improve the staple, even should it be found in other respects inapplicable to practice from the cost exceeding the profit.

In these remarks novelty is not aimed at: the practices recommended having all been successfully tried in different situations and circumstances; my object has been, merely to endeavour to reduce them to principles, under the idea that isolated facts, however valuable in themselves, never carry the same weight that they do when combined by a leading theory into a system. To lay the foundation of such a system is my wish, that I have yet even partially succeeded I am far from thinking, our disjointed materials being inadequate to the work, but if no other advantage results than that of proving the principles I have assumed inapplicable to practice, one step has been made towards ultimate success; and in the mean time, I shall continue the investigation which is here commenced, in the hope of ere long being able to produce a more satisfactory exposition of the principles which should guide us in cotton agriculture, than was possible within my present contracted limits.

ABSTRACT OF DISTRICT REPORTS.

GANJAM.—Method of cultivation not mentioned. Very little cotton is raised in this district, and would have been supposed of inferior quality, had it not produced much of the thread from which the Chicacole muslins are fabricated. The nature of the soil is said to be inferior for this kind of culture, and therefore that it would not be advisable to encourage the growth of cotton. This opinion is not borne out by the tabular return, and it seems probable, from the greatness of the produce (46 maunds of seed-cotton per acre), that, though the country cotton may be somewhat inferior, the American cottons may be profitably introduced.

VIZAGAPATAM.—Three kinds of cotton are cultivated in this district, namely, annual early white, triennial white, and red cotton. After the usual ploughing and manuring, the first is sown in June when the rains set in---when three feet high the tops of the branches are cropped---in the third month pods are produced, and in the fourth gathering commences and continues about forty days. 2d. The triennial white. This is esteemed the best, it is sown in alluvial soils near hills in June---the gathering commences in December and continues four months. The plants are afterwards cut down nearly to the ground, and when the petty monsoon begins the ground is well ploughed and manured, and sometimes a crop of light grain reaped before the cotton harvest begins. This process is repeated the second and third year, during both of which the plants are in full bearing. It is not stated whether, as in Coimbatore, two crops are gathered annually. 3d. The red cotton is sown on *ravutty* soil (described as sweetish), previously well ploughed, from September to the middle of October, in rows about a foot distant. When the plants are about a foot high, the ground is harrowed two or three times a week, and afterwards ploughed with a peculiar plough, called *goontroakah*, between the rows. They begin to bear in the sixth month, and continue bearing three months.

The peculiarity of culture in this district is the system of pruning, which, if the following statement is correct, is most advantageous. Of white cotton, a veesum of land, consisting of four coontahs, each forty-two feet square (= 7056 square feet or somewhat less than 1-6th of an acre), is said to produce 30, and, if on well manured *gooraopah* soil, even 40 maunds of seed-cotton. There must surely be some error here, as the district table gives 46 in place of 180 maunds to the acre, which this statement if correctly calculated implies. Some Sea Island and Upland Georgia seed, sown in gardens, succeeded well and produced fine cotton—these ought to be encouraged, especially the former, for coast culture, being easily cleaned and the method of cultivating triennial cotton being, there is reason to believe, equally applicable to it.

Rajahmundry.—Two kinds of country cotton are in cultivation, the white and red. The white is sown in well prepared rich black soil, and may be repeated annually, together with paddy seeds and coondooloo (cholum ?), early in June. The field is then ploughed again, to bring the seeds into regular rows, and harrowed with hurdles to level it, and afterwards weeded several times. The gathering is in March, April and May, the produce is about 12 maunds of seed-cotton per acre. The same plants often produce a second but inferior crop, and are said not to be injured by much rain. This seems to be a very unusual variety, and might be successfully tried on the Malabar Coast, the cotton plant rarely admitting of cultivation on soils capable of producing paddy, unless in the instance where the latter is grown in trenches dug between beds for the purpose of draining the soil intended for the other, which does not seem to be the case here, at least it is not so mentioned.

Red cotton.—This is sown in a waxy soil (stiffish clay ?), previously well ploughed—completely sandy ones do not answer. This kind of soil pays an assessment of only 2½, while the black pays about 6 rupees the acre. The sowing commences in October in furrows 8 (3 ?) to one fathom, the seeds about three inches apart. When about eighteen inches high, the ground is weeded, and the operation several times repeated, till April, when the harvest begins. In fair seasons the produce is about 20 maunds, or 500lbs. of seed-cotton per acre, which, at the rate of sixteen rupees per candy, leaves a profit of ten rupees to the cultivator.

This variety seems well suited for culture in the hottest and most arid tracts of the interior, from its astonishing power of resisting heat and drought. The produce being always great in proportion to the continuance and intensity of the hot land winds, but does not give a second crop. It is afterwards stated the rows are two feet apart. I presume the latter is correct.

Guntoor.—In this district drill husbandry is adopted in the cultivation of cotton. Country cotton is sown in preference in black soils, but is not confined to them—the rows are about four feet apart, and the plants from one and half to two. The same methods and soils were tried for American and Bourbon cottons, but both failed, principally it is supposed owing to the heat and want of rain that season, but perhaps partly also owing to the injudicious selection of soil. Contrary to what takes place in Rajahmundry, the sea breezes are said to cherish and improve the plant, while it shrinks under the stroke of land winds and fails to give its crop. An interchange of seeds might benefit both.

The sowing takes place in August and September, the gathering commences in February, and is over by the end of March. It seems very desirable to repeat the trials with American and Bourbon cotton, the former on the calcarious saline soils of the coast, the latter on the gravelly and loamy ones of the interior.

Masulipatam—Nellore—Tanjore.—Neither of these being to any considerable extent cotton producing districts, the reports from them afford no information respecting the cultivation of the little that is produced. Nellore derives most of the cotton required for the supply of its manufactures from the Ceded Districts.

Trichinopoly.—At the date of the report from this district the cultivation of Bourbon cotton was rapidly extending, and promised soon to become general in those parts of the district that afforded suitable soils. It had altogether failed in the black soils, but succeeded well in reddish loamy sandy ones. Of country cotton two kinds are cultivated, oopum purthee and laudum purthee (no explanation are given of these terms, but I presume they mean the annual and triennial cottons, purthee meaning seed-cotton). The former is a coarse inferior sort, cultivated in black soils. The seeds are sown in November and December, and the gathering takes place in April and May. The latter is raised in both black and red soils and is of fine quality. It is sown in July and August and gathered in December and January, and sometimes produces a second crop. It is frequently mixed with other dry crops. It does not appear that the large produce of this district is in any respect indebted to superior husbandry, as no account is given of the plan pursued.

Salem.—The cultivation of both American and Bourbon cottons have been successfully introduced into this district, especially the latter, but it appears to me is still far from having attained perfection. This being so completely an inland district, the Upland American varieties only can be expected fully to succeed. The Sea Island and other coast varieties being so sensitive to removal from the coast, probably from requiring a soil strongly impregnated with saline matter, that they immediately deteriorate on being carried inland, will most likely fail, but should certainly be tried. The country cottons of this district are good, but afford only the moderate return of about 3 rupees per acre to the cultivator. The mode of culture, it would appear, presents nothing peculiar with respect to country cotton ; for Bourbon cotton Mr. Fischer recommends the best red loam soils at a distance from the hills, which he thinks are apt to attract rain and cause dews, which are injurious. The plants produce the best crops the second and third years ; pruning has not been practised at any stage. It would I think be worth trying the effect of the Persian plan on some spots both of the second and third years duration. The mixture of light grain crops in the cotton fields is constantly practised, and is said not to injure the cotton crop, but no comparative experiments have been made. The seed is sown in August and September, and the first harvest begins in May.

COIMBATORE.—The very copious agricultural details from this district enable me to give a fuller account of it than of any of the preceding, or rather I should say renders it difficult to give a sufficiently condensed summary. There are several varieties of country cotton cultivated, but I shall confine myself to two, the annual and triennial, or oopum and laudum purthee, the former is cultivated in deep black, the latter in the lighter loamy calcarious soils. In the latter only the American and Bourbon cottons can be cultivated successfully.

The lands, previously manured, are prepared for the reception of the seed by repeated ploughings, after the first rains in April; but the sowing does not take place until August, September, or even October, according to the setting in of the rains, when, after two or three additional ploughings, it is sown broadcast, the seeds being previously soaked in cow-dung or red earth and water, and dried to prevent them adhering to each other in sowing. When about a month old, the ground is again ploughed with a light plough made without iron on the share, a proof that they are not so tender at this age as usually supposed, which at the same time weeds the ground and thins the superfluous plants. In about another month they are weeded again, after which they are considered sufficiently matured to resist the weather. The same methods are practised with the American and Bourbon cottons. In ordinary seasons the gathering commences in March and continues till the end of April. If rain falls about that time, the plantation is again ploughed and cleared from weeds, and in July and August a second crop is gathered, amounting to about half the first. In January of the second year these processes are repeated, and the two crops gathered as in the first, and again in the third year, after which the plants droop, cease to bear, and are rooted out before the setting in of the North East monsoon. If the soil is black it is re-manured and prepared for a fresh crop of oopum purthee, but if the plantation has been triennial, the land is fallowed or sown with some common light grain. The time for ploughing, sowing and gathering the annual, is the same as for the triennial, plant. Experiments were in progress, at the date of the report, for determining the comparative advantage of row planting, but have not yet been communicated. It seems probable much advantage would accrue from liberal pruning after each crop. The cultivation of Bourbon and American cotton is rapidly extending, and in some talooks has nearly superseded the indigenous triennial; the plan of culture being the same for both, and no advantage obtained on that account, its extension must be solely attributable to its superiority. The collector, Mr. Drury, thinks that if the cost, of conveyance to the coast for exportation was reduced, a further increase would take place, greatly to the advantage of the district.

Madura.—The cultivation here is the same as that generally pursued elsewhere. The ground is repeatedly ploughed, and manured, in the usual way, by penning sheep on it, and at the setting in of the rains in September and October the sowings commence. The gathering season of the earlier sown is from January until the middle of April, and of the latter from February to May. The produce varies exceedingly in different talooks. In the northern parts of Ramnad it is only about 176 lbs. per acre. In Pallemuddum, another division, it is about 226; while in Terumungalum, the best cotton country of the district, it amounts to 391 lbs. and is of the finest quality, much of it being exported under the denomination of "Fine Tinnevelly," and, as I have been informed by a trader, is among the best exported under that name. Much of the light calcarious soils along the gulph of Manar will probably be found well adapted for the cultivation of American cotton, in which case the facility of export will give it a very decided advantage in bringing it into foreign markets.

Tinnevelly.—In this, as in all the other districts, the black soils enjoy the preference for annual country cotton; the lighter loamy ones for triennial. The sowing commences at different seasons. In the north western talooks, between July and September, according to the weather; in the eastern from October to December. Both the Bourbon and American cottons are now cultivated to a considerable extent in this district, in light alluvial, and red, soils, apparently with much success, but the comparative advantages resulting from the foreign and indigenous sorts are only known to the cultivators. There appears, so far as I could discover, no peculiarity in the method of culture of either. It is probable much advantage will be found to result from the introduction of the Sea Island and New Orleans varieties on the coast, as there is every facility in procuring calcarious manure from the abundance of shells and madrepores to be found there. The latter are now sometimes used as a building stone, or burned for mortar, but, pounded, they would perhaps prove even more useful as a manure. Both these kinds may also, I believe, be introduced with success on the Islands off the coast, and thus render these barren wastes profitable farms. I would recommend this hint to the attention of those who have the opportunity of trying the experiment.

P. S.—After the preceding observations were in the printer's hands, I fortunately met with a report of a special committee of the Agricultural and Horticultural Society* of India, detailing a series of experiments, undertaken under its direction to determine

* Trans. vol. 2, Appendix.

the best methods of cultivating the American cottons, and the kind best suited for India. The results are upon the whole unsatisfactory; owing principally, the committee believe, " to our ignorance of the proper seasons for sowing; bad seed; and from the selection of land, rather forced upon the society and wholly unsuited to the growth of cotton, being *too rich* in most places, and *too salt* in others." The committee observe " This fact is so palpable that it hardly requires remark. It has shown itself in every progressive step from sowing the seed, to the last stage of cropping the cotton.

" 1st. It has shown itself by the rapidity and luxuriance of vegetation in the production of abundance of wood, leaf, and flower, but little produce.

2d. By an almost unceasing process of blossoming, thereby exhausting the plant before it had attained maturity, and consequently deteriorating the staple in the ratio of excessive bearing.

3d. By the general result of short produce, an invariable sign of too rich and moist a soil.

4th. To another cause your Committee are disposed to ascribe failure, viz. an improper mode of planting."

The Committee also point out that broadcast sowing will not answer with the American plant. That the soil requires to be dug to a great depth, about 18 inches, the tap root extending nearly that length, and, if obstructed, checking its growth. This precaution cannot be so necessary in the light sandy soils I have recommended, as in the clay one of Akra, but, when cotton is cultivated in the best manner, must always be attended to. Transplanting was tried on one occasion, but without any beneficial result. The following paragraph I quote entire, as affording so pointed a confirmation from experience, of the plan I had advocated from analogy, and which will I trust be frequently tried, so as to leave no doubt of the advantages likely to flow from a systematic adoption of it in all kinds of cotton cultivation, to which experience may prove it applicable.

" Your Committee would beg your special attention to the following paragraph from Mr. De Verinne's letter to the officiating Secretary, dated Surdah, 5th August, 1835: " The out-turn of the last season 1832-33, shows a more favourable result, as 60 maunds of clean cotton and 180 maunds of cotton-seed, were gathered at the farm from December 1832, to May 1833. It must be recollected that the greater part of this cotton and seed was produced from 90 beegahs and 9¾ cottahs of Upland Georgia cotton cultivation, sown the previous season, the stumps of which only were left after the severe hail storm of the 25th and 26th March, 1832; these stumps threw out fresh shoots during the rainy season of that year; were partially pruned, and well hoed up at the conclusion of the rains, and yielded from December to

May, 12,963 lbs. of cotton, including seed, making an average per beegah (of 120* square feet), 144 lbs., which cotton after having been separated from the seed, gave 40½ lbs. of clean cotton, and 103½ lbs. of seed."

"The only tolerable crop in point of quantity (for the quality of the Upland Georgia cotton has been already declared excellent) has therefore been derived from the stumps of plants of the previous year, destroyed by the storm, and this simple fact involves a question of great importance, viz. *whether this description of cotton might not be more successfully cultivated as a perennial plant, under a course of treatment similar to that which Mr. Bruce describes as followed in Persia; where, after the goats and sheep have been allowed to browse freely upon the plants (after crop), the peasantry are permitted to complete the work of spoliation by breaking off the remaining branches to the root.*"

"The hail storm which occurred, and did so much damage to the plant in 1831-32, was the means of providing us with a tolerable crop in 1832-33, and really seems to point at the Persian *method, as an example* for others to follow in India."

The Committee strongly recommend the introduction of the Upland Georgia on an extensive scale, as affording cotton of as fine a quality as that produced in America from the same sort.

Regarding the table which accompanies, the following explanation of its objects and contents may prove useful. The first eight columns show the kind, the average produce, charges, and cultivator's profit on an acre of ground under cotton cultivation, also the time of sowing and gathering in each district: the ninth exhibits the number of square feet required in each to produce one pound of seed-cotton, calculated at the rate of 43,560 square feet per acre and 25-lbs. per maund. This method of examining the subject by bringing it better within the grasp of the understanding, and more forcibly contrasting the rate of produce, enables us to form a more correct estimate of their respective advantages and fertilities, and of the degree of encouragement that should be given to any particular kind of cultivation in each. The next four columns exhibit the agricultural charges, assessment, and profit on an acre of rice cultivation, and the number of square feet required to produce a pound of paddy at the rate of 23⅛-lbs. per mercal. The remaining four columns refer to dry grain crops. The numerous blanks in the last two sets originate in omissions of the district returns.

* This is surely a mistake, as it seems utterly impossible that nearly 58,000 lbs. of seed-cotton could be produced on a patch of ground the usual out-turn of which rarely exceeds 500 lbs., and which is said to produce an immense crop when it amounts to 1,000 lbs. At the rate of 14,000 square feet to the beegah 144 lbs. is equal to 1 lb. to 100 sq. feet and not 1⅓ lb. to the square foot.

I have experienced much difficulty in the construction of this table, from the prevalent, but not commendable practice among the Revenue Officers, of employing in their reports, under their local denominations, the weights and measures of their respective districts, often without appending any scale by which they can be reduced to the more uniform and better known English standard, whence, it is probable, errors will be found in several of the calculations.

The discrepancies, which the columns of square feet place in such a prominent point of view, are such as to lead to a suspicion that some of the returns are erroneous, for, if not, the obstacles to success in some districts are vastly disproportioned to those of others. As, however, it is by this kind of scrutiny that we are most likely to arrive at satisfactory conclusions, I cannot hesitate to add these columns; the more so, as they suggest an easy method of testing the produce, which may prove of great use in ascertaining the relative productiveness of different portions of districts, and possibly of occasionally relieving the burthens of some who may be over assessed, and equalizing those of others who are under-rated. Nothing can be more easy than its application to grain crops. The produce of a patch of five or ten feet square, of medium fertility, has only to be weighed, or rather measured, and the result, with the requisite allowances for inequalities of soil, watering, &c., applied to a greater or less extent according to local circumstances, will give a nearly correct average for the whole. If to this column I could have added the quantity of water required to irrigate the land during the ripening of a crop of paddy, an important point would have been gained, by enabling us to calculate not only the quantity of paddy annually lost from want of water caused by evaporation from tanks alone, but the value of every tun of water in a reservoir however large; and, lastly, how much we would gain by the substitution of deep and narrow tanks for the broad and shallow ones now in use, after deducting the additional cost of raising the water by artificial means, such as pumps, buckets, &c. worked by windmills, steam engines, or other mechanical contrivances for generating power.

[It is well known that, by an order of Government, dated 1st March 1836, Dr. Wight, the able and zealous author of the foregoing remarks, was appointed to enquire into the state of agriculture in Southern India, and to report on the best methods of cultivating cotton, and other most valuable products of this country, with a view to the more complete development of the resources of our Indian Empire; for, unless European skill and science are brought to bear on agricultural or commercial enterprizes, improvements are not likely to be effected. The Minute of Consultation, which accompanied the above named order, was highly creditable to the Madras Government, and contained a just tribute to the talent of Dr. Wight, the result of whose labours will no doubt be evident, in process of time, in the amelioration of agriculture, and in the increase and improved character of the products of the soil.

Science, in modern times, is not made up of abstract speculation and recondite theory, but is applied, in a practical manner, to the every day purposes of life, for the general good of mankind and the advancement of civilization. A visionary search after the philosopher's stone has been discontinued, and the industrious cultivation of the natural faculties, has taught the true secret of transmuting the sordid things of the earth into gold, by that knowledge, an alchemy worth knowing, which multiplies and improves the arts and manufactures, and with them the rational enjoyments and the comforts of life. Thus the applications of science, as well as its theory and principles, are eminently suited to the pages of this Journal, and, in this light, we hail Dr. Wight's contributions as most valuable. If any other argument was necessary to prove their suitableness, we need only adduce the fact of the Royal Asiatic Society having formed a Committee of Agriculture and Commerce, expressly for the furtherance of objects like that which constitutes the subject of this paper; thus declaring (what seems hitherto to have been lamentably lost sight of) that the objects and purposes of an Asiatic literary and scientific institution, are not solely investigations into the literature, antiquities, history, and opinions of Asiatics, but also the infinitely more important one of holding up the lights of European science to dispel the mental and political darkness of the East.

While the labours of Dr. Wight are thus mainly directed, as a public servant, to the improvement of agriculture and commerce, and to the acquisition of a knowledge of the statistics of our empire in India, botanical science is, at the same time, incidentally advanced; for wherever the foot of this ardent botanist is planted, new additions to our flora are

(See page 100.*)*

Cotton.

Districts.	Kind of cotton.	Produce with seed per acre.		Charges.			Assessment.			Profit.			Sown.	Gathered.
		M.	lbs.	R.	A.	P.	R.	A.	P.	R.	A.	P.		
Ganjam......	C. cotton .	15	0	10	0	0	2	8	0	10	0	0	December ..	June to September
Vizagapatam	C. cotton .	46	0	18	8	0	14	0	0	12	8	0	June	November........
Masulipatam	C. cotton .	8	0	2	11	6	2	11	7	0	8	11	Unknown ..	Unknown.........
Rajahmundry	C. white cotton ..	15	3	4	8	0	6	15	0	0	10	6	June........	March to May.....
Do.	C. red cotton. .	20	0	4	8	0	3	0	0	8	8	0	October	April ....
Guntoor......	C. cotton .	10	0	1	11	8	1	9	8	1	10	8	September..	Feby. to March....
Tanjore......	C. cotton .	16	14	15	7	6	0	7	6	3	8	10	January	May and June ....
Trichinopoly	C. cotton .	31	8	8	6	6	5	5	5	9	14	1	Nov. & Decr.	April and May....
Salem	C. cotton .	14	0	6	0	0	5	0	0	3	0	0	June to Sept.	1st crop Feb. March. 2d do. Nov.
Do.	Bourbon cotton ..	15	0	6	8	0	5	0	0	3	8	0	May to Octr.	1st crop Oct. 2d do. Feb. Mar. & Apr.
Coimbatore ..	C. cotton .	12	18	5	0	4	1	8	8	2	6	0	October.....	Feb. to Apr. & again in Aug.
Do.	Triennial cotton ...	11	12	3	13	11	1	8	8	2	9	5	Aug. to Octr.	1st year Aug. to Sep. 2d do. Feb. to April, 3d do. Aug. to Sept.
Do.	Bourbon cotton..	10	17	3	15	4	1	8	8	3	0	0	ditto ..	
Madura	C. cotton .	15	15	6	10	8	1	14	7	7	0	11	Octr. & Novr.	Feb. Mar. & April.
Tinnevelly...	C. cotton .	11	3	5	4	0	2	1	7	2	1	8	July to Decr.	January to June...

(1) Black paddy—(2) White paddy—(3) The mean of Shembapeshanum and Caur paddy—

N. B.—The blanks are omissions in

Soil.	No. of square feet required to produce 1-lb. of cotton.	Nunjay Grain. Paddy. Charges.	Assessment.	Profit.	No. of square feet required to produce 1-lb of paddy.	Punjay Grains. *A* Cumboo—*B* Jonna—*C* Tennay. Charges.	Assessment.	Profit.	No. of square feet required to produce 1-lb. of	
	sq. ft.	R. A. P.	R. A. P.	R. A. P.		R. A. P.	R. A. P.	R. A. P.		
Unknown.....	$116\frac{1}{6}$	—	—	—	—	—	—	—	—	
Unknown.....	$37\frac{7}{8}$	9 14 0	14 0 0	6 2 0	$37\frac{7}{8}$	—	—	—	—	
Black soil....	$217\frac{3}{4}$	4 15 0 4 9 8	4 6 9 7 13 8	1 9 1 6 14 7	120 (1) 72 (2)	3 11 10	4 5 10	1 9 2	180	*(B)*
ditto	$115\frac{1}{4}$	—	—	—	—	—	—	—	—	
Waxy sandy soil.........	$87\frac{1}{9}$	—	—	—	—	—	—	—	—	
Black soil.....	$174\frac{1}{4}$	—	—	—	—	—	—	—	—	
B. soil........	$105\frac{1}{5}$	5 1 8	5 4 9	1 6 11	$65\frac{5}{12}$(3)	1 11 2	1 0 5	0 4 5	33	*(A)*
B. soil........	$55\frac{5}{8}$	—	—	—	—	—	—	—	—	
B. soil........	$124\frac{4}{9}$	9 14 9	7 15 0	2 0 0	$272\frac{1}{16}$	2 12 10	2 2 9	0 2 0	$47\frac{1}{2}$	*(C)*
Red soil......	$116\frac{1}{6}$	—	—	—	—	—	—	—	—	
Black soil.....	137	—	—	—	—	2 1 5	1 6 0	0 11 2	$104\frac{31}{48}$	*(A)*
Red loam mixed with limestone and sand.	$151\frac{7}{9}$ $163\frac{1}{7}$	— —	— —	— —	— —	— —	— —	— —	— —	
Black soil.....	$111\frac{11}{16}$	5 4 8	3 15 6	1 2 5	$21\frac{1}{8}$	3 4 4	1 5 11	1 1 4	$35\frac{1}{24}$(5)	*(A)*
Black soil.....	$156\frac{11}{46}$	7 7 0	14 3 0	6 12 0	$10\frac{7}{18}$(4)	3 10 5	2 1 7	0 11 6	$35\frac{1}{5}$	*(A)*

(4) The mean of Peshanum and Caur paddy—(5) The mean of six different soils.

the district reports.

made known, and, independent of the advantages enumerated above as accruing to agricultural and commercial operations, the Government is bestowing a great and lasting benefit on science by his employment in his present capacity—which, we earnestly hope, he will be permanently fixed in. This expression of our desire we know will be responded to by the world of Science in Europe, where the exertions of Dr. Wight are most eagerly watched and duly appreciated.

But to return to the paper on the cultivation of cotton. The first part has been sent in the form of a Circular to the Collectors of districts, and the supplement, which has just been communicated to us, will be added thereto.—Editor.]

Supplement.—I have been favoured with two valuable letters from Mr. Fischer of Salem, the only European in these provinces personally engaged on a large scale in cotton agriculture. These letters, so far as they refer to that subject, I have thought it advisable to publish ; partly for the sake of the information they convey, and partly on account of the opportunity they furnish of extending my own remarks to some points not touched upon in the foregoing remarks.

" With regard to your Cotton Circular I do not think I have much to say on it. Among the causes of failure of the attempts in 1832-33, you omit to mention two main ones, viz. the improvidence of Government, in keeping the seeds lying in their godowns, until they were almost entirely spoiled, and in distributing them in an injudicious manner. You are besides wrong as to the season for sowing the Bourbon and other finer cottons. They should be sown as soon after the rains of April and May as possible, and may be sown till August ; but to do it after that would ensure failure. The Bourbon cotton, and all the American kinds I have tried, yield three crops a year, and last for five or six years. One crop from the April and May rains ; a second from the July and August rains, and a third crop after the monsoon. This last is the chief crop—I am speaking of old plants ; new plants sown in May do not yield till the following February. The ryots hereabouts do not care about soaking the seed before sowing, but they are particular in cleaning it of its adhering wool.* This is done by mixing it in a thick solution of cow-dung, drying it in the sun, and then rubbing it between the palms of the hands.

" I have been particular in destroying all my Georgian or Upland cotton seed plantations, because I found the plants not so productive

* This should be attended to : many of the small quantity of seed sown by me were lost, owing to the woolly fur not having been removed previous to sowing.—R. W.

as my Bourbon, and the produce not so good in quality, nor so valuable in price. The Sea Island, which I introduced the last three or four years, has got mixed with my Bourbon—indeed I think the two are one and the same kind, and that that grown (in America) is superior from superior culture, soil and climate. Nothing will induce the natives to take more trouble with it in this country than they can possibly help. The Sea Island seed, which I introduced within the last six or eight months, I am taking great pains with, and am keeping it carefully separate."

"I got your letter yesterday, on my return from Mooganoor. To save your next edition of the Cotton Circular from as many errors as possible, I hasten to set you right on two points wherein you err. First, if I said the Georgian cotton did not answer so well with us as the Bourbon, for I forget the terms I used, I did not mean in point of growth, for it grows equally well, but I meant in respect to quantity of produce, and value of said produce in the English market. My Bourbon always sells some pence higher than all the American Uplands, and the Bourbon plant, as far as I have been able to judge from my experience in the interior, and the experiments made by Major Sim at Madras, which were not a few, is a hardier and more productive one than the Georgian. The second point is, that all my experience, and I have Georgian plants of the third generation, in different soils too, is adverse to your notion, that this kind of cotton passes into the Sea Island kind in the course of time,* by change of soil and climate. I can easily conceive that this error arose from the mixing of seeds, which I know it requires great care and trouble to prevent. Nor does my supposition that the Bourbon is degenerated Sea Island at all support such a notion. Why, one has a black smooth seed, and the other a green woolly one, and the quality of their fibres is different. You may be assured the one will no more change into the other, than an European to an Indian, or *vicê versâ*, by change of soil and climate.

"I do not know the Egyptian cotton; without it is that which we did not know in my garden, and which we called vine leaf cotton, from something we saw one day in the Bengal Agricultural and Horticultural Transactions. I send you a little of it in the accompanying

* Mr. F. has misunderstood my meaning, for, in saying that the two kinds are said to be convertible under certain circumstances, I never for a moment supposed that those suited to change Upland into Sea Island were to be found in Salem. On the contrary, I stated that the very reverse was more likely to happen by the Sea Island deteriorating. That long staple cotton should degenerate, and become short, is not at all wonderful, when sown in an unfavourable soil and climate; neither do I think the other is so in opposite circumstances. We daily meet with such changes, and the whole science of agriculture is founded on the susceptibility of plants to undergo them.

packet to tell me if it is so.* If this is Egyptian cotton, it is one of the largest staple I know; the cotton itself is dingy and not very fine, but that may have arisen from my having planted it out of season. We shall see how this year's produce is—I do not know where I got the seed. The plant you may remember is not so shaggy or shrubby as the Bourbon. Finally, my argument is, that, if the Sea Island seed answer with us, as I have ascertained it does, why take the same trouble to introduce an inferior sort, that will introduce a superior one?"

"We do practise the Persian plan you recommend, more or less, according to the zeal and industry of the cultivator, but they all know its value, indeed in most cases it is absolutely necessary."

I the more readily introduce the above extracts, as they afford satisfactory evidence of a progressive improvement in the Salem and Coimbatore districts, in the method of cultivating this valuable plant; as may be seen by contrasting them with the following extracts from some directions drawn up by Mr. Fischer in 1826, and communicated to the then Principal Collector of Coimbatore: a copy of which he gave me some months ago while in Salem.

"The seed should be committed to the ground in the month of August"—"the plants bear in the month of May of the succeeding year, and do not require to be removed for two or three years or more"—"I have endeavoured in vain to prevail upon the natives to prune the plant when a month or two old, and again after the cotton seasons, which I am convinced would be of infinite service to their growth and fertility."

From these extracts it will be perceived that, ten years ago, August was esteemed the best time for sowing. In the interval it has been ascertained that, unless the sowing be completed by August, it will ensure failure, and that the most advantageous season is immediately after the rains, in April and May. This is certainly a point of importance to know, since it appears that much of the failure of the Calcutta Akra farm experiments, was attributed to ignorance of the proper time of sowing.

It does not appear that, in the earlier attempts, more than one crop was gathered annually: three are now currently taken. At that period nothing would induce the ryots to prune after the cotton season; but now it appears they have discovered that the rough, but economical, method of pruning, practised in Persia, is an improvement, and

* The sample sent is not Egyptian; it looks more like Pernambuco. The true Egyptian is scarcely, if at all, distinguishable from Sea Island; and is supposed to have been imported from America. R. W.

practise it accordingly. Then the plants lasted three years, now they continue five or six years. How far we are indebted to my paper for eliciting these facts I am not prepared to state, nor indeed is that a matter of the slightest importance, so long as we get them; I have therefore only to add, that it will afford me much pleasure to receive many similar communications from all parts of the country, as so many practical confirmations of the justness of the views I had deduced from a careful consideration of broken and detached notices, met with in books, or picked up in conversation.

The opinion expressed in such forcible language respecting the effect of change of climate, soil and culture, in changing, not only the quality of the produce, but even the variety that produces it, into another, higher or lower in the scale of perfection, requires some further notice, because it is a point of great practical importance, and one which should be well understood. It is not, therefore, with the little ambition of attempting to controvert an opinion advanced in opposition to one casually expressed by myself, and which is as likely to be wrong as right, but in the hope of holding out inducements to the enterprising to endeavour, by carefully conducted experiments, to improve even our imported varieties, and to direct attention to a mark, by which the uninitiated in the mysteries of selecting cotton, may possibly be enabled to tell when his crops are deteriorating, and when a change of seed has become necessary.

Because the seed of the Uplands are covered with a green down, and the fibre different from that of the Sea Island, which has a smooth seed, it is the opinion of Mr. Fischer that it is next to impossible for the one to pass into the other, under any change of climate, soil and culture that can be applied; while, at the same time, he expresses the opinion that the Bourbon may be deteriorated Sea Island. Following Roxburgh, who supposes that the Bourbon cotton is the West Indian *Gossypium Barbadense*, it follows that both it and the Sea Island are the same species; for the Sea Island was introduced to these islands from the West Indies, hence the change to a more congenial soil has raised an inferior kind in the one case to the first rank, and in the second to the next place, both the Sea Island and Bourbon being superior to the average run of West Indian produce; but in the one, Sea Island, the seeds have become smooth, in the other, they are covered with fur; such at least is the case with all I have seen. Again Mr. Spalding, a careful and observant American cultivator, says, " it may be remarked, however, that short stapled wool is of better quality, when grown near the sea than at a distance * * * that the three long stapled varieties, namely, *sea-islands*, *mains*, and *santees* (local denominations of the three varieties), may each be sub-divided into several other varieties (sub-varieties), which are only distinguish-

able by the seeds and qualities of the cotton; the first sub-variety is covered entirely with *green* fur, and has a beard of that colour at one end, while the seed of the primary varieties is pure black, but is sometimes wholly or partially covered with white fur."* Here then it appears that neither the absence nor presence of fur, nor its colour, afford any distinctive mark, since all the three smooth seeded varieties of long staple cotton have sub-varieties with woolly seed, the colour of which is sometimes green, sometimes white, while the fibre of the green kinds is different, being considered of inferior quality.

A rather remarkable circumstance, bearing on this point, was presented to my notice the other day. A quantity of smooth Egyptian cotton seed was sown at Madras, a portion of the produce was presented to the Agri-Horticultural Society at its last meeting (5th July), more than one half of which was covered with a thick coat of green fur; of the remainder some seeds were partially covered with the green, some with white, fur, and part quite smooth. The stock of seed from which these were reared was received direct from Egypt, and was nearly all smooth and black. While such changes take place, and with such rapidity that they are completed in a single generation, it is impossible to adopt Mr. F.'s opinion as to the non-convertibility of varieties into each other, especially of superior into inferior; the opposite change might not be so easily effected. Nor would it be safe to answer in the negative the following question of Mr. Seabrook, though I confess I cannot adduce any facts which would enable me to answer it in the affirmative. "May not the seed of the Sea Island cotton have been received from the isle of Bourbon, and may not the Bourbon planters have got the seed of their highly prized cotton from Persia, since it is now known that the Persian is no ways inferior to the Sea Island, except in strength?" Roxburgh, as already stated, supposes the Bourbon cotton to be derived from the West Indies; an opinion in which I confess I am inclined to agree, notwithstanding the West received from the East (as stated by Mr. Seabrook) the genuine cinnamon and mango about the middle of the last century; because it seems exceedingly probable that ships might carry it back in exchange, and it is highly improbable that the produce of the one remote island, would spread rapidly over the numerous and widely separated islands of the West Indies; while nothing is more probable than that it should rapidly spread in Bourbon, where it had been ascertained, by a few trials, that both the soil and climate were most favourable for its extended and profitable cultivation.

However, be that as it may, it seems now most certain that the absence or presence of fur on the seeds, so far from being

* I here quote the meaning, not the exact words, of Mr. Spalding.

received as a specific distinction, cannot even be admitted as characteristic of a permanent variety, since it may be produced to a great extent in one generation, and it is possible may be removed in the next. This much I can state from personal observation, that seeds, taken from the same pod, may some be smooth, some partially clothed with fur, and perhaps will, in the next generation, be found completely covered. These facts lead to the suspicion that, in proportion as the staple deteriorates, the fur begins, and that we may thus account for the fur seeded varieties of the Sea Island being less valuable than the smooth ones, and the Egyptian cotton above alluded to, though good, being inferior to the original stock. I do not presume, in the present state of our knowledge, to attach more weight to these views than that of considering them probable conjectures, but yet I think them deserving of attention on the part of the cultivator, because, should future observation and experiment prove them to be well founded, they afford him a sure criterion, by which he may know when it is necessary to change his seed ; as an accession of fur on smooth or very slightly furred varieties will indicate the progress of deterioration ; and, *vice versa*, the diminution of fur on the rough seeded ones, may afford the best indication of a congenial soil, climate and mode of culture.

Before leaving this subject I must again remind the reader, that I am not in possession of facts sufficient to establish the doctrine I have broached, and that these inferences must, for the present, be viewed as mere conjectures, the value of which remains to be determined by future experiment and observation ; not conducted in one country only, or on a small scale, but in many, and in no part of the world so favourably as on the Sea Islands. How interesting it would prove to see the short staple, woolly seeded, Uplands, converted, in the course of a few generations, into smooth seeded, long stapled, Sea Islands ; and the green seeded sub-varieties restored to their place in the first rank : while we, with careful management, may be able to raise our country cottons to a much higher rank than that they now usually hold in the English market ; the improvment being equally marked by a return to smooth seed.

The concluding question of Mr. Fischer's second letter is direct and unanswerable, and in the Salem district his experience of both kinds entitles his opinion to the greatest deference. But, though backed by experience, the only sure guide, in that particular district, we are not yet authorized to adopt it as a general rule, because it has already been shown that at Ingeram the Bourbon entirely failed, while both the Sea Island and Upland Georgian perfectly succeeded, at least on a small scale. The experience acquired in the Salem, Coimbatore, Mysore, and some of the talooks of the Tinnevelly districts, leave

not a doubt of the success with which Bourbon cotton may be cultivated on the red loamy soils with which they abound; but it does not follow that it will equally succeed in the sandy, saline, coast soils (though it has been ascertained to do so in those near the coast containing a considerable admixture of clay), the very ones in which American experience gives us reason to expect the American kinds will thrive best. The determination of this point, therefore, is still an important desideratum in Indian cotton agriculture, as there are thousands of acres along the coast that might be most profitably devoted to that kind of culture. We know that, generally speaking, cotton cannot be successfully cultivated on a wet soil; our information as to the fitness of a very light sandy soil is, on the contrary, very defective. Should experience, however, prove them equally suitable, for the culture of the Bourbon, Sea Island, and Upland Georgian, and the former of these retain in both situations its superiority, there cannot, in all such places, be a question of the propriety of retaining it to the exclusion of the inferior sorts; but it would be premature to come to such a determination at this period of the enquiry: while, at the same time, it is exceedingly desirable that a course of experiment should be entered upon near the coast, for the purpose of determining the fitness of coast soils for this kind of agriculture, which has not hitherto been tried to any considerable extent on them. In America, the advantages of a coast station, for the cultivation of cotton, is strongly insisted upon, and to that circumstance alone much of the superiority of the cotton of the Sea Island district is ascribed. Thus Mr. Spalding declares, "the only essential point is a saline atmosphere, with it, any soil in Georgia or Carolina may produce fine cotton, without it, no soil will."

This is certainly laying down the law in strong terms, more so, I think, than the evidence he adduces in support of it warrants, and I hope much more so than our experience in this country will ever admit, and leaves room to suspect, that he has allowed some pre-conceived notions, respecting an imaginary property of the atmosphere, to mislead his usually correct judgment, and led him to mistake the difference between an atmosphere loaded with saline particles, and a soil impregnated with deliquescent salts, acted on by a simple humid atmosphere, thereby maintaining that moderate degree of moisture requisite for the most perfect development, as an annual, of both the plant and its products.

In India a coast exposure may not be found quite so indispensable to the production of fine cotton. In America the plant is from necessity an annual, being too tender to survive the winter frosts; hence it must pass through the successive stages of its existence in the summer season or during the short period of about seven months.

Our aim, on the contrary, is to counteract this rapid course, and permit the plant to attain a greater degree of maturity before beginning to bear, in the hope by so doing that the quality of the produce may be improved and augmented, at the same time that the duration of the plant is prolonged. The tendency of the plant to shoot its root straight down into the earth to a considerable depth, where, even in the dryest season, it enjoys constant humidity and coolness, enables us to accomplish this object, and at once change its habit from annual to perennial. So far as our attempts to cultivate this valuable variety have yet extended, we have not found any soil in India equally congenial with the American ones, but we certainly ought not to give up the attempt to find similar ones; for, if we succeed, owing to the perennial character of our plant, we may expect, if such is possible, even better cotton than the original, on the strength of our second and third crops of other perennial kinds, being somewhat better than the first. The light saline soils of the coast, it appears to me, are those most likely to approach the American ones, while, from being more easily penetrable by the roots, they hold out the prospect of being better suited to this kind of culture than the more stiff and clayey ones of the interior, while their saline impregnation will no doubt contribute to aid the so called saline atmosphere, held to be so necessary in America, but which, according to their own showing, is not enough.

Thus it is stated that the cotton plant thrives best in an alluvial soil a little impregnated with salt—that the most productive soils in Louisiana are deeply tinged with red, and well impregnated with salt—in Guiana, salt is considered to promote the growth of the cotton plant, and the old lands are frequently flooded with salt-water. These statements of the value of a saline soil, the existence of which is susceptible of demonstration, afford strong grounds for doubting the doctrine of a saline atmosphere, a questionable property, and lead us to infer, that the superiority of our black soils for the production of cotton is partly attributable to the saline matter with which they are so generally impregnated.

Regarding the experiments, mentioned in the first part of this paper, as in progress in my garden, I may take this opportunity of adding, that, owing to the intervention of some errors, but too apt to occur in first experiments to mar success, they have not hitherto gone on so prosperously as I could have wished. They may, however, be adduced, as affording a striking exemplification of the tenacity of life of the cotton plant, for, though transplanted, in very dry weather, into ground inadequately prepared, scarcely a plant was lost. In the instance of the short stapled American plants, I have failed in accomplishing one of my objects, that of preventing the early flowering, for they are now, though but few of them exceed nine

inches in height, covered with flowers and full grown pods, some of which have already burst. Some time was certainly gained by the expedient of transplanting, as several of the plants had begun to flower before that operation was commenced, and hurried it, though the weather was most unfavourable. The plants have now a shrubby, dwarfish appearance, but the pods are very large, and the cotton of the few that have opened is of fine quality. Should the rains soon set in, so as to admit of the ground being thoroughly dug and lightly manured, while the plants themselves are pruned, I have no fear of yet obtaining a very favourable result. The Bourbon cotton plants, the ground for which was better prepared, promise much more favourably; they are now growing freely, look healthy, and are only beginning to flower. The Sea Island plants look delicate, but will probably recover their vigour on the accession of rainy weather. A few, which were more carefully managed, and planted in better soil than the rest, are very strong and vigorous, and promise a large crop. Several of these have been topped and are throwing out numerous strong lateral branches, giving reason to anticipate a vastly increased produce, not less, I think, than four or five times the quantity that otherwise would have been produced.

The soil on which these are planted proved on being dug a very stiff clay, in place of a light loam which I at first supposed; and part of the failure is I think fairly assignable to its not being sufficiently wrought before being planted. Another portion of ground, the soil of which is a light sandy loam, remains to be planted, and will still afford a good means of comparison, though not so favourable as if it had been planted at the same time.

The following extracts, occasionally considerably abridged from Dr. Ure's work on the cotton manufacture of Great Britain, exhibiting some of the more important points of American cotton agriculture, may prove of use to those so engaged, in a country where that book is as yet but little known.

" The only essential point seems to be a saline atmosphere; with it any soil in Georgia or Carolina may produce fine cotton, without it, no soil will do so." This doctrine seems very questionable, as already explained.

" The preferable time for sowing Sea Island cotton seed is from the 1st to the 15th April." " Any vegetable manure is good for cotton, but it must be applied judiciously, for excessive luxurance renders the fruit scanty." This is on the Sea Islands themselves, and with the view of raising an annual plant, which must have finished its crop before the frosts of November and December have commenced. With us about the same season may equally be found the best for sowing, though not for the same reason. Mr. Fischer's experience leads to this conclusion.

" In August very boisterous and rainy weather usually occurs, and loosens the soil so much, that, if the plants are not well earthed up, they are apt to be blown down and destroyed. It is in this month also that caterpillars and blight make their appearance, sometimes to such an extent as to destroy hundreds of acres of plant in the course of two or three days."

"The fields should be entirely shaded from the sun when the plants are fully grown, the distance between their roots should be adapted to this circumstance ; while thinning and hoeing to remove weeds, the earth should be well gathered round the roots." " The number of workings (hoeing and earthing up the roots) seldom exceed six ; the last about six weeks before the crop begins. In general, the plants, which grow about three feet high, are left about ten inches apart—four feet, one foot—six feet, two feet and half apart—one hundred and thirty pounds of cleaned or ginned cotton per acre is considered a good crop." " In the Sea Island district four acres produce about five cwt. of ginned cotton—four of which are white, and worth about 10*d.* per pound; the other stained, and only worth 5*d.* per pound."

According to the above rules the fields appear to be more crowded than is consistent with deriving the greatest produce from the land, and the bushes are not cropped, which, by making them spread, in place of rising to so great a height, would tend to protect them from the dangerous storms of August. Nothing could be more easy than to top with the finger and thumb the leading shoot of each plant, in the course of their various workings, and at once thin out to two or two and a half feet; labour would be saved, the ground less exhausted by having only half the number of roots to nourish, and be sooner and better shaded from the sun; while, from the greatly augmented flower bearing surface thus produced, the quantity of flowers and fruit would be proportionately increased, perhaps to the extent of not less than 20 or 25 per cent.

In gathering and packing the cotton for transmission to market, much care is bestowed.

" In gathering care must be taken to remove the locks of cotton without breaking off any of the dry leaves, and if any fall on the cotton before the picker has secured his handful in the bag, they must be carefully separated. In preparing cotton for the market, the seed-cotton is first whipped—that is, put into a long conical sloping cage of open wire or basket work, closed at one end, traversed by a shaft furnished with a number of cross bars. The cage is fed by a hopper, while the shaft is rapidly turned by a crank, or handle, by which the cotton is whisked round the cage, till it drops out at the lower open end, completely freed from any sand or other impurities, which drop

out between the bars of the cage—then picked or motted by women—then ginned, lastly, picked again to remove stained portions, broken seeds, &c., and is then finally packed for the market." "The leaves and pods of long staple cotton are smaller than those of the short; the pod of the former opens into three, that of the latter into five." This s far from constant, as the pods of all my short staple cotto ns have but four segments.

"The cultivation of short stapled cotton is less expensive and less precarious; the winds are not so high in the interior, the valves of the pods do not open so much in ripening, and less is lost by the cotton falling out spontaneously. The short staple pods are allowed to hang on the plants till they are white with wool, so that they may be reaped at one or two gatherings, instead of ten or twelve employed in the Sea Islands, and therefore half the cost of labour."

"It may be remarked, however, that short stapled wool is of better quality, when grown near the sea, than at a distance, and it thrives most luxuriantly in alluvial soils a little impregnated with salt. In Louisiana, between the Arakansa and Red river, the soils are deeply tinged with red, and well seasoned with salt, and give the most abundant crops of the best quality cotton. There the English acre produces about 1000 lbs. seed-cotton, or 250 ginned, while in the hill country, from the Mississippi to the Carolinas, not more than 500 lbs. of seed-cotton can be obtained."

"The average produce for both long and short-staples is about 500 lbs. of seed-cotton, or 125 ginned, per acre. Some fields produce double that quantity, but they are exceptions which can never serve as guides to just conclusions, respecting either the wealth or productiveness of the country—the besetting sin of agricultural statements is their exaggerations."

This statement falls more within the bounds of probability than the very exaggerated one of Captain Basil Hall, who informs us that from 12 to 1600 lbs. is the average produce per acre of ground throughout the United States.

In the Indian peninsula, the average produce, in eleven districts, the two principal cotton ones not included, is, for all kinds of cotton, 430 lbs. of seed-cotton per acre. This result is not a great falling off from Mr. Spalding's estimate, when we consider the greater degree of care bestowed on the culture, and the more productive kinds in cultivation; and holds out a strong inducement to us to persevere in the attempts we are making to cope with the Americans, in working this rich mine; the more so, now that that favoured country has supplied us with her own weapons with which to engage in the honourable rivalry, of contending who shall most contribute to the comforts and

BRITISH MUSEUM

Sketch from Tonitoray to Paumban.
Tungachemuddum
Ukkamuddum
Paumban
Pagoda
Tonitoray.
Mundapum
To Columbo
Track of Vessels to the Coast of India
Coral Reef
Proposed New Cut
feet

conveniences of the rest of mankind, by supplying the means of providing cheap cotton fabrics of every kind and description.

I shall conclude these supplementary observations by extracting from the Transactions of the Agri-Horticultural Society of India, vol. 3, page 132—the following brief account of the mode of cultivating cotton in Egypt, drawn up by Mr. Waghorn.

" Maho cotton is sown in trenches about five feet apart, and four or five seeds in every eighteen inches. If they all spring up, they take out all but one, which they conceive the most healthy.

" It must be sown in a fat soil, a sandy soil will not do. The cotton grounds are situated near the banks of the Nile, or some canal near it, where there is water the whole year. It must be watered every three or four days when it first begins to sprout, and afterwards every ten days. The crop is gathered from June to January, two crops each year from each plant; the plants should be renewed every three years."

X.—*Account of the Operations for widening the Channel of the Pamban Passage in the Gulf of Manar.—By Colonel* W. MONTEITH, K. L. S. *Chief Engineer.*

It has long been earnestly desired by the Government of Madras, as well as by the public at large, that the obstructions to the navigation, which extend across the gulf of Manar, should be removed, or, at any rate, a clear passage opened for the coasting vessels both of Ceylon and India, to enable them to convey the produce of Malabar, Travancore, and some other most fertile districts to Madras, the great point of export, without the delay, risk and expense to which they are at present exposed.

In consequence of the representations made to the Court of Directors by the Right Hon. S. R. Lushington, then governor of Madras, a survey of the generally used passage between the island of Ramisseram and the peninsula of Ramnad was made by the joint efforts of the officers of the Royal Engineers from Ceylon, and Major Sim with a party from Madras. During the year 1828, some experiments were made as to the practicability of improving this channel, and some of the most prominent rocks were removed. The passage was also rendered more direct and easy of access.

The work was, however, discontinued, and orders were received not to renew the attempt, strong doubts having been expressed of ultimate success. The officers' reports were published in 1833, and public at-

tention was again directed to the subject, the experiments ordered to be renewed, and 5,000 rupees granted for this object; with the further assistance of stores from the arsenal, a party of Sappers and Miners, and 50 convicts : and I was directed to superintend the work, which is now in active progress, and promises to be successful, as far as the sum allowed can be expected to go; and it is now almost certain that a 12 feet channel can, and will, be obtained at this point, the gulf of Manar having only this depth for a considerable distance.

The following Journal details the operations when I was at Pamban :

Journal.—Feb. 1st 1837.—Embarked on board the native brig *Agamud Buksh*, with 3 serjeants, 1 havildar, 1 private of the sappers, and the stores destined for the experiments at Pamban.

2d.—Anchored at Pondicherry, as there were a great number of passengers for that place, with some cargo, which was engaged to be landed by the evening. Leaving the party on board in charge of the stores, I landed for the purpose of examining the light-house, which I obtained permission to do and take any observation required. It is a plain, but neat, structure, 90 French feet above the level of the sea; the lights fixed, and of good description. It is altogether well adapted for the purpose, but requires a little more ventilation, as the light appears to become dim after some hours burning.

3d.—Embarked at 7 A. M., and soon after weighed anchor.

4th.—At day light off Negapatam, and in the evening took our departure from point Colymere. I directed the serjeant of the watch to see the lead cast every half hour. The first sounding was 5 fathoms, which soon increased to 6, at which it continued for about 15 miles; then to 7, which held till one in the morning, at which time I made the tindal anchor. As we could not be far from land, if the current was as strong as is generally supposed, we came to in 7 fathoms; bottom a strong blue clay, unmixed with either sand or coral. On trial found no current whatever, and the next morning a piece of timber, thrown over during the night, was still near the vessel. Ascertained the latitude by the meridian altitude of a star, and found we were 17 miles from land.

5th.—Weighed at day light, and at 10 A. M. were 3 miles from Pamban. The soundings now rapidly decreased to 5, 4, and 3 fathoms; I called on the tindal to anchor, which he did ; in swinging round the vessel struck violently, and I found we had only 1¼ fathoms at the stern. The vessel was hauled off in an hour, the weather fortunately being very moderate, and by 2 P. M. the stores were all in boats.

6th.—I inspected the detachment, which, with the party I brought, amounted to 1 second Lieut. C. M. Elliott, 5 serjeants, 1 jèmadar, 6 non-commissioned officers, 82 sappers, 50 convicts, with some peons belonging to the collector of Madura.

The greater part of these men had been here since the 18th of January, and had been fully employed in the erection of work-shop, store-houses, barracks, an hospital, and huts. The buildings were well adapted for the purpose ; the men were allowed to lodge themselves, which was preferable to the plan proposed of providing a barrack, which I had intended, thinking, as this was only a temporary duty, the men might not bring their families.

The building originally intended for the sepoys will become, when finished, available for the lodgment of the convicts. It is advancing very slowly ; as we are obliged to bring clay from a distance of two miles, a sufficient party cannot be spared for the purpose. It is not of much importance, the convicts being lodged in a choultry, which is more secure.

Ordered part of a stone-roofed passage in the old fort to be repaired, as a magazine for the gun-powder. Only one sick in the detachment of 90 men.

7th. Examined the country for three miles round to ascertain what materials were procurable : found abundance of dwarf jungle, but the trees, almost entirely *Mimosa*, with branches shooting out at right angles to the stem, which is generally twisted, very difficult to work, and too heavy to form rafts. Lime and free stones plentiful, and near the sea-shore a few palmyras and tamarind trees, with abundance of coco-anut, the only other timber on the island.* Purchased some mango and teak planks from a merchant, and selected eight canoes, to form rafts for the work in the great channel.

8th. Inspected the small channel, and ordered a party to remove some large stones, and another to bore the rock at its northern extremity, which nearly blocks up the passage. Proceeded to the great channel, and ordered it to be correctly marked off by small floats with flags, at intervals of about 30 yards. Before leaving off work, fired two small charges of powder in the two holes that had been finished ; one split the rock into small pieces, the other found vent through the bottom, and did little execution.

9th. The buoys were this morning laid down on one side, and anchored with large stones. Purchased two catamarans from a vessel to complete the floats ; no light wood being procurable in the neighbourhood. The working party succeeded this day in boring 10 holes in the rocks at the head of the small channel, which were immediately loaded and fired. Charge 8 and 10 oz. of powder, contained in bottles 9 succeeded perfectly, and shattered the rock into small fragments which were easily removed by the hand. The remainder of the men employed in deepening the lower part of the channel. This is the most

* Except *Ethee* planted near pagodas, and along the great roads to Ramisseram.

profitable use to which the labour of the party can be applied, during the time we are waiting for the supplies from Ceylon, and completing our preparations. It is of little less importance than the great channel; all the boats with the cargoes of the vessel pass through it, which they can do in all weathers.

11th. Men employed as yesterday; fired 8 more blasts, a few with increased charges, and the holes at greater intervals; the splinters were thrown to a considerable distance. Large charges can only be employed when the rock is entirely under water. This day some carpenters and smiths offered, and were hired on trial; they had come from Ramisseram and the neighbouring villages. The whether is now variable, with a southerly wind for a few hours in the day, which denotes the calm season. Hastened the work as much as possible, and heard from a vessel which left Colombo three days since, that the Ceylon party were near.

12th. Sunday.

13th. The artificers employed on the rafts and boats. The sappers and convicts in removing the rocks broken by the mines, and in deepening the channel.

14th. Twenty-one sappers employed as yesterday in removing the stones, and the convicts in deepening the channel. Artificers on the boats. The new jail advances slowly, as we can only spare 10 men to work on it.

15th. Party generally employed as yesterday, and 12 more holes bored in the main dam of the small channel. Our success was not equal to the former trials, the match for exploding under water being of an inferior quality. This is the first we had tried of that manufactured at Madras, in imitation of the English; some part was made by the Engineer sergeant-major, the rest at the depôt St. Thomas's Mount: eleven out of the twelve failed. The convicts, who had shewn signs of insubordination for some days, positively refused to work in the water. I was obliged to order 12 sappers under arms and secure 6 of the ringleaders, who were slightly punished by the Chouckdar, and the remainder forced to work. The extent of punishment which can be awarded appears to be little understood, and is the cause of the small value of this labour under the Madras establishment.

16th. This day 2 sergeants and 13 men sick, principally trifling accidents and bowel complaints from constant work in the water. The men as yesterday, and 4 trying to extract the charges which had not exploded, but without success. The vessel expected arrived from Ceylon bringing some stores, 8 seamen and a diving-bell.

17th. The raft for working in the great channel was this day finished and launched; it rode well and promises fully to answer the purpose. Eight more charges, fired with the English match, answered perfectly; the others as yesterday failed.

18th. Almost the whole of the men assisting in unloading the stores, and bringing brush wood to lodge the diving-bell on. The shears, constructed with four coco-anut trees, were not strong enough to support the weight; procured some large palmyrah trees, six of which were employed in making another pair of shears—16 holes fired to day, 15 with excellent effect, the match Europe. The main dam is now passable at all times of tide for boats.

19th. Sunday.

20th. Sent a large cargo boat to receive the windlass of the diving-bell, but it went to pieces with the weight. There are no craft here capable of receiving this machine, nor people to work it; being 5 tons in weight, the diving-bell may be said to be unmanageable, and has, I believe, never been used in Ceylon.

21st. Diving-bell raised out of the Ceylon boat and suspended till a bed of fascines, stones and trees could be prepared to receive it. Went to Ramisseram to ascertain what resources it could furnish, in boats or materials, but found little or nothing; the town depends almost entirely on the pagoda, and the pilgrims who visit from India.

22d. Men almost entirely employed with the diving-bell; the stage finished except the palmyra trees.

23d. The bell lowered, and by a mistake of the native officer brought on shore. It is now useless trying to remove it, so it has been allowed to remain till required, or fit boats provided for its reception. It will not be required till near the close of the operations. Ceylon government vessel, the *Wolf*, sailed for the pearl banks.

24th. A new shed was commenced this morning for the blacksmiths; the one they formerly worked in being required for the stores received from Ceylon. The sappers principally employed in enlarging the mouth of the small channel; suspended the work at the jail, not being able to procure clay, and a sufficient party could not be spared to bring it without detriment to more important works.

25th. The rock at the mouth of the little channel had been bored in eight places, and at 11 A. M. the blasting commenced with very good effect; two charges with the Madras match failed, the others succeeded perfectly, and entirely broke the rock, giving an opening of 24 feet to the channel. The charges were this day contained in leather bags of undressed sheep skins, covered with dammer, and are preferable to either the tin, cases or bottles; the expense is also much less than the tin and not so subject to injury in tamping.

26th. Sunday.

27th. This is the first day the sea was sufficiently calm to admit of work being carried on in the great channel, where the raft was anchored, and answered perfectly. Four holes bored in the rock, but not finished before the tide had risen, and the current became too strong

to load. Put poles into the holes to mark their position, and returned. The party at the small channel had removed some large fragments of rock with greater ease than before, by means of the windlass received from Ceylon; this also obviates the necessity of the men being any length of time in the water. New work-shop finished, and the second raft nearly completed.

28th. The raft again proceeded to the great channel, and succeeded in boring six more holes in the rock. At 12 o'clock commenced loading but the tide rose so rapidly, and the sea becoming rough, were obliged to postpone the firing till to-morrow. Party on shore erecting a hut for the seamen, and twenty-two men in the small channel, who removed in the course of the day about twenty tons of stones; ten more holes prepared for blasting. The health of the men has appeared to improve; there are at present only six in hospital, a decrease of seven since the middle of the month; they have been less in the water than before.

March 1st. The great raft proceeded to the main channel at seven A. M. and by 11 had seven holes ready for loading; they were instantly charged and fired, six with very good effect; the charges were contained in leather bags, and Bickford's hose burnt with its usual certainty. One failed, from the fuse being cut by a stone, but the powder was taken up on the following day perfectly dry. Another raft was nearly finished; half the party still employed on the small channel, and the convicts in bringing coco-anut trees from some distance.

2d. The breeze was strong from the N. E. and the sea high in the main stream; the decked canoes rode perfectly well, but the progress was slow, as the divers could not work at the bottom owing to the strength of the current; only five holes were bored and three were loaded and fired. The weighing boat brought up some tons of stone, but could not work after 11 A. M, from the force of the current and wind. Fourteen men were permanently attached to the weighing boat; some large stones were brought up with apparent ease, and lashed on the sides, after which they were cut away at about 100 yards from the channel.

Though our progress in the principal object of deepening the main channel has as yet been trifling, in fact is just commenced, the results are such, as to leave no doubt regarding the ultimate success of the work, and, in the mean time, the small channel has been rendered much more practicable than formerly, and, when completed, will be of little less importance than the main one. It is not included in the present project, but forms a necessary part of the undertaking, vessels being subject to more delay, waiting to re-ship their cargoes, than in passing the reef.

Our preparations as regards boats are now nearly complete, to the full extent we will be able to man. We have three rafts and two weighing boats, and expect a small dhoney with two double catamarans from Jaffna, which will require two reliefs, of twenty-four men each, which is about the number available for duty. According to the rate at which we are now progressing, it will take about three or four months (100 or 120 working days), to deepen the channel three or four feet, according to the thickness of the upper strata of rock, which it is proposed entirely to remove, and give a general breadth of forty yards, besides removing a difficult bend in the centre of the channel.

The rock is very easy to work, and on an average one pound of powder breaks two tons, which we have no difficulty in weighing and removing to a distance on the reef. The divers fix the strings to the stones, which are hoisted up and lashed to the sides of the boats, the smaller only being taken on board. The vessel is then hauled off to a distance, and the stones cut away; the largest stone we have yet had occasion to remove has been about 3600-lbs., and took ten minutes to hoist and secure.

I have restricted the present plan to a breadth of forty yards, being nearly what it has at present.

Before more is undertaken, it will be necessary to ascertain what can be done to give a greater depth of water over the horse-shoe bank, which extends from this island to the main land, through which there is said to be only two channels, having ten feet water at the highest tides. The difficulty of passing this is little considered by the native commanders, as the risk is inconsiderable, and the inconvenience only extends to the delay of partly unloading the vessel. There are few crafts drawing more than ten feet frequent this passage, as the inner channel is said to have but twelve feet. I cannot satisfactorily account for the formation of the bar. The quantity of sand carried through is very trifling, and I imagine could not extend so far into the gulf of Manar, when the strength of the currents evidently sets on the east and west shores, where the present passages are found. It is just possible that this may be the ruins of the dam, when carried away by some great storm, a fact still recorded. In this case, not being subject to fluctuation, or any increase from a constant moving body, if once cut through by dredgers, or other means, it would always remain open, the current increasing with the depth of the water, and the bank being composed of coarse sand with fragments of coral and large gravel, totally differing from the small sand on the coasts, would not be subject to fill up. This is rendered probable by our experience in the small channel, no sand having lodged in the part lately excavated.

3d. Wind very strong with a high sea; no holes could be bored

from the violent motion of the rafts; the party returned and were sent to the small channel. The weighing boat took up about six tons of stone, but was also obliged to return about noon and joined the party in the small channel. The second raft was launched this morning.

4th. The boats were at their stations in the main channel by 7 A. M. and at 11 A. M. eight holes had been made in the rock, some of which were charged with 8-lbs. of powder. The stock of the English hose being expended, tried that made at Madras, which entirely failed, and we were obliged to have recourse to the tin tubes and portfires. The attempt to fire all at the same moment failed, and only one charge took effect, the tubes of the others being damaged by the concussion; the attempt was therefore given over, and the party returned at 1 P. M. a number of holes being ready in the small channel, directed them to be fired with the match newly received from Madras. It all failed, in a strong current; reprimed with portfires, and exploded the charges in succession. One piece of portfire exploded on being fired and overturned the boat containing six men; fortunately was a small charge, had it happened with a large one, the whole must have been destroyed. A number of large stones removed out of the small channel, which is now used by all light vessels, affording them the means of being dragged against the current.

6th. Loaded twelve holes this day, and again tried the fuse made at Trichinopoly, which failed as before, with one exception, which exploded after 22 minutes; as it was considered to have been extinguished, a diver was sent to recover the case, who returned saying it was still burning. The boat had nearly reached the shore when the explosion took place; no accident occurred. A third raft nearly finished.

7th. Recovered the cases which had been lodged in the mines the day before; powder generally dry. Re-charged 7 others; two of these failed; a small quantity of powder, above what the box could contain, having been allowed to remain in the tubes, they burst before inflaming the charge, and water got in. This is a singular fact which experience could only prove. The effect was good and we may now be considered as fairly at work.

8th. Having received samples of the powder hose from several quarters, made a number of experiments both in and out of water, but found no reliance could be placed on it in either case. With the English, made by Mr. Bickford, in sixty-five trials, not one failure took place that could be fairly attributed to the hose.

9th. Four new holes were ready by 11 A. M., but the current did not allow their being fired till half past twelve, when nine were charged and seven succeeded perfectly, detaching a great quantity of stone. Ordered in future the tin tubes to be dammered, as there were some small defects in the solder which admitted water. To this date the work performed by the convicts was below what ought to have been done.

Directed they should in future be divided into small parties, and the work performed measured previous to dimissal.

10th. The raft proceeded to the main channel, and had made eight holes at seven feet distance, there being already ten; but some had been covered by the explosion of yesterday. Eleven were loaded, but some of the skins and tubes were again found imperfect. Six only took effect, but the powder in the others was preserved. Those made by sergeants Reardon and White were very good, and reflect great credit on their attention and diligence; a rock of ten tons, which had obstructed the channel, was entirely removed.

11th. Continued the work as yesterday. Eight new holes made, and twelve remained of the former work. Eight were exploded with only one failure occasioned by the match going out. Directed the charges to be diminished on all prominent rocks affording good lines of least resistance, as we found the stone broken into small pieces; fragments of from one to two tons are best for the weighing boats.

13th. Two rafts for boring were now ready and commenced in the morning. This day fired 70-lbs. of powder, in thirteen charges, all of which succeeded admirably.

14th. All the most prominent rocks having been cleared out of the centre of the main channel, directed a cut should be commenced from south to north of twenty feet in breadth and three feet deep. This plan has been adopted to prevent the lodgment of sand in detached holes, which is difficult after to distinguish from the rock; when a certain length is obtained, the current is expected to prevent any lodgment. This day seven hundred and nineteen feet of rock were removed; the work altogether satisfactory.

15th. Fired fifteen charges or 74-lbs. of powder; the effect was greater than we had ever before experienced, several blocks of stone of two and three tons each were torn from the bed and projected several yards from the mines.

16th. This being the Buckreed festival, the Mahomedans had leave, and no divers would work; two parties of convicts this day worked exceedingly well, and did as much as any other men. Six charges only were fired for want of the divers, and all with good effect.

Since my last report our progress has been regular and satisfactory; the men are now accustomed to the work, and perform more than double what they were able to do at first. We formerly raised about 300 cubic feet of stone per day; the return for the last five has shewn 700, and, when the catamarans arrive, will probably be 1000. The maximum I think this party capable of performing.

The experience now gained is sufficient to form a correct estimate of both the expence and time necessary to complete the undertaking, and

is not subject to any considerable error, the work being simple, the operations certain, and results known.

The reef, or bed, to be cut through, extends about four hundred yards, from N. to S., double what has been previously stated. The mistake has taken place, from the centre having only five feet at low water, and the flat bed of the rock, both above and below, from six to six and half; vessels being obliged to reduce their depth to five feet water felt no inconvenience from the previous obstacle, but the case will be totally different when the centre reef is removed to ten feet. This is now in progress, and has been gained on in an extent of about eighty yards in length, by twenty feet in breadth, and will be completed to those dimensions, through the whole extent, in one month from the time we have been fully at work.

I have adopted the plan of cutting a narrow channel, through the whole extent in the first instance, rather than working on the breadth, as I found the current swept this long narrow cut, and prevented the lodgment of any substance which might be brought in by the current, whereas the other method only produced a pool for its lodgment. It will also enable the Government to proceed to the extent they may think proper, a positive advantage having been obtained, be the channel broad or narrow. A certain breadth is necessary for the convenient passage even of small vessels, and this season I do not think it can be extended to more than fifty or sixty feet—there being at present about seventy days remaining, if it be certain that work cannot be carried on after May (a fact I do not think yet established). The Government will, I trust, permit the detachment to remain at such a distance as to allow their returning to the work in August, when the season is known to be favourable for two months. It will be a great subject of regret if the object is not now obtained, or if it should be imperfectly executed, when the success is positive and the expence inconsiderable, in comparison with the advantages to be gained. A small party can be left with a non-commissioned officer to take charge of the boats, stores, &c.—they may be the seamen.

17th. This day fired twenty-three charges, in 102-lbs. of powder, with very good effect. The boats carried off 800 feet of stone. The work of the convicts under the boatswain equal to any others.

18th. This being the last day of the Buckreed festival, no work could be done. The few Roman catholic divers we got to replace the others, were not equal to the work ; eight holes made by the two rafts, and 509 feet of stone removed.

20th. Fired 63-lbs. of powder, in fifteen charges ; two failed from the pipes having been cut, and were the remains of what had been fired before ; it being necessary to spare as much as possible the tubes, all the

country match having failed. The divers and boatmen had not entirely recovered from the effects of the festival. Removed 652 feet of stone.

21st. Only half a day's work was done, as the weighing boat and tackle required repair; fifteen charges fired, and 597 feet of stone removed.

22d. The current was to-day exceedingly strong, and the divers gave up early; six charges were fired, and 350 cubic feet of stone removed.

At day-light proceeded to examine the passage through the sand bank. Its figure, as well as the soundings, do not appear to have varied in the slightest degree since the survey made under Major Sim. The channel is precisely where it then existed, with a depth of five and a half feet at the lowest tides, and about eight high water. It gradually increases to twenty feet, which is found near the shore close to the island of Ramisseram, and the greatest depth close to the edge of the bank on its eastern side; the remainder of this space has seldom more than ten and twelve feet water; bottom, rocks mixed with coarse sand, broken coral, &c. All vessels are obliged to pass over this part. Those proceeding to Ceylon have an open passage, with eighteen feet water; the channel to the coast of India is round the southern extremity of the bank, and has only twelve feet at low tides. Vessels can, however, gain the open sea by the Ceylon passage, which is seldom done except when commanded by Europeans. This route is well sheltered by a chain of coral reefs and islands, which protect it from the S. W. winds. I followed the whole extent of the bank, and found in no place but the one above mentioned more than three and three and a half feet. Near the eastern side, close to Tonitora, the bank is only a few yards in extent. It is said an opening was forced by the storm of 1814 through this point, of equal depth to the other, which gradually closed up, and it is now such as I saw it in the year 1809.

Having thus ascertained that no other passage existed, I returned to the point before mentioned, and commenced a minute examination of its composition. Contrary to the opinion I had previously formed, the centre and most shallow part was composed of fine sand, mixed with blue mud, and covered with marine plants, abounding with insects and sea worms, which would appear to indicate that it never suffers any material change, and is not, according to the reports of the masters of the dhonies, covered with sand to nearly a foot in depth during the S. W. monsoon. I remained on this point till the tide had commenced to flow from the north, running at the rate of nearly five miles an hour over the reef; here the rapidity was trifling, never exceeding one and a half miles per hour, the velocity being lost in the great expanse of water over which it spreads on passing the reef.

This renders it doubtful if the force of the current alone, even with the aid of an embankment, would be sufficient to increase the depth, bound as the soil is by the roots of weeds. An embankment, however, if extended to the shore, would throw a much greater body of water on this point, and if a passage was at the same time opened by dredging, the current would I think be sufficient to prevent its again filling up. The expence of this, beyond the purchase of a dredging machine, and the vessel to work it, would not be great, to save expence the embankment should be made of piles, cut near the spot, and filled up with loaded fascines, also procurable from the thorn trees which cover the whole island, many of which are sufficiently long and straight to answer this purpose of piles; the wood is hard, heavy, and lasts better than teak under water. The crooked timbers of large cargo boats are generally of this wood.

This strikes me as the only plan likely to give a moderately deep passage, without a very heavy expence, and is not liable to any uncertainty but what must exist in the execution of all works exposed to the action of the sea. The extent to be thus excavated is only four hundred yards, and the embankment double; but much of the latter is in very shallow water, where long piles would not be required.

Another plan, suggested by Major Sim, of cutting a canal through the eastern part of the reef, I found liable to much greater uncertainty, though it had a flattering appearance at first view; it would require greater labour than the main channel, and, when completed, be of difficult access.

The improvement of this passage I therefore consider as confined to a depth of twelve feet, high tide, which is, however, a very important object, and can be attained at a moderate cost.

I now proceeded to examine the site fixed on as presenting the greatest facility for the excavation of a canal, and, after following the line of coast for a considerable distance, returned to the spot where the sea forced a passage in 1814, and which is in every respect the best adapted for the purpose. Commencing from the southern side of the cut, I found the sea clear of rocks, and deepening rapidly to eighteen feet, which is obtained at four hundred yards from the shore, and continues till it joins the inner passage to the coast of Madura. This point forms an extensive basin, well sheltered from all winds, where vessels could anchor with safety, and immediately in front of the passage, leading into the open sea, with a depth of eighteen and twenty feet, which increases after passing the chain of islands and reefs to five and eight fathoms; bottom, coral rocks, with a few spots affording anchorage on beds of mud and sand.

The party I left on shore had succeeded in clearing away the thorn bushes, so as to afford an open view of the nullah, which is nearly on a

level with low water, and on some places salt water still stands in pools. The distance across is only two thousand one hundred and thirty feet, and the soil perfectly easy to work. A canal would therefore be readily excavated, offering only the difficulty of pumping out the water to gain a depth of eighteen feet below the level of the sea, and would be a work of less difficulty than cleaning the ditch of Fort St. George, or even the canal across the esplanade. The beds of sandstone would rather assist than retard the excavation, and furnish an excellent material to line the banks of the canal; a precaution absolutely necessary to prevent its filling up with the sand of which the soil consists. Thus much of the work would therefore be performed with certainty; the expence would be considerable, but still much less than works of this scale and importance generally cost. The most formidable part of the undertaking still remains, viz. continuing the canal into deep water on the northern side, where the rock shelves gradually into twenty feet, at a distance of one thousand two hundred yards, covered with coral in every form, and approaching in some places to within a few feet of the surface. This is, however, a simple question of expence, and not of difficulty; the execution is perfectly easy and certain, with time and means. But I fear that nothing less than piers on each side would effectually protect the canal, or enable vessels to pass along it at all times, and lock gates must be formed at each extremity of the land cut, to prevent a current, and consequently any deposit or passage of sand. Should a small quantity by any means lodge at the mouth of the outer canal, the water retained by the gates, and discharged by means of under sluices, would effectually remove such an obstruction. The appearance of the rock, as also of the coral, would indicate that no such deposit takes place; and, if no current is allowed through the passage, it appears probable, and even certain, that the cause of an accumulation of sand would be prevented.

The only point to be decided is, if, with a channel of twelve feet, which may be obtained at this place, there will remain any object in having another of eighteen. This is a question I am not competent to decide; as it must depend on the importance attached to the commerce of the country, as also regarding the passage of steam vessels or ships of war by the shortest and most practicable route at all seasons.

23d. Both weighing boats in full work, and by 2 P. M. had removed 1130 cubic feet of stone, about 75 tons. The explosions had not so great an effect as usual, having come on a flat bed of rock, extending across the whole channel, affording no weak points from which a line of least resistance could be found; the tamping was generally blown out. Directed the holes should be made five feet deep, quite through the

rock, and charged with 12-lbs. of powder each, at intervals of four and five feet.

24th. The holes were not sunk to the required depth, as the divers could not reach the bottom with their hands, and the sand or powdered stone was washed out of the ladles before reaching the top. Directed an auger to be made with a tin tube for this purpose. The work was, however, very good, and 1414 cubic feet of stone removed. The boatswain with the convicts did more work than the sappers, which must be attributed to the excellent superintendence they were under.

25th. The holes were now sunk to the required depth, and one 10-lb. charge fired, which made a crater of about four feet in diameter. The other holes were charged with less, as the rock was found not to be of great thickness; three craters were produced, but the rock was not as usual rent beyond the actual effect of the charges. We regretted much not having it in our power to have simultaneous discharges, which would make a large excavation at once. The present method will be tedious and fatiguing, from the length of time it takes to charge and return to the same spot. The rock is so exceedingly soft it offers little more resistance than clay, so on a perfectly flat body the effect was comparatively trifling; a considerable portion of rock had been detached, and 1524 feet was removed, through the energy of the person before mentioned, boatswain Morris; 103-lbs. of powder expended, in seventeen charges, without a single failure. The leather cases well dammered and dusted with lime, answer better than tin cases, and are of much less cost.

27th. Received a letter from the assistant government agent at Jaffna, and also the boat and machinery for weighing stones. The frame and wheel of this machine are calculated for a boat of double this size, and as much above the centre. It will not answer for stones of any weight, which is much to be regretted, as the machinery is of the best description, and the boat a beautiful model. Removed today 1143 feet of stone, part of the hands being employed on the Jaffna boat.

28th.—The wind has changed decidedly to the south, with more current and sand than we had before experienced, and the water discoloured. Three charges only fired, from the difficulty of finding the holes, but removed 1715 cubic feet of stone, the greatest quantity yet taken up.

29th.—Tried a raft, with a small iron windlass, as a weighing boat, which worked very well, but requires seamen and a European to manage it. Removed 1620 cubic feet of stone, though the current was strong from the south. We had previous to this been principally engaged on the south side of the reef, as being the most sheltered, but now ordered the work to the centre and north. A boat arrived from Colombo, with timber and catamarans, the wood of the latter very spongy, and in an advanced stage of decay. The season is too far

advanced for others to be procured, I have, therefore, taken it and ordered two double catamarans to be formed for receiving the stones from the weighing boats, and two canoes. The blocks, &c. have enabled me to increase the power of our machinery, which now requires fewer hands, and has enabled us to spare what is necessary to man the extra number of boats.

30th. The boats employed as yesterday, and sixteen holes made in the rock ; the boatswain was ill with fever, and his party did not perform half the usual duty. I directed they should be kept at work every day, till the regular quantity was done, and the arrears brought up. Eleven charges were fired with excellent effect—three holes had been attempted on a rock having only a few inches of thickness, and sand below; they in consequence failed.

31st. The current has been running strong from the south, with no interval of slack water. The divers could not work, but six holes were made; the men having been carried away several times I ordered the boats to return, only two charges were fired after three hours hard work. About 900 cubic feet of stone was raised, a large quantity under such circumstances. Tried the Jaffna weighing boat again, but without success, she was only saved from turning over by the prompt aid of the other boats. The stone attempted to be raised was about 2000-lb. in weight, or a quarter of what had been done by the dhonies and tackles.

The result of this month's work, is, I trust, on the whole, as much as could have been expected, from the many delays we met with in the early part of it. This place affords no facilities, the most common articles had to be procured from a great distance, and not then without the utmost exertion on the part of the people employed.

Pamban is a village of 70 families, composed entirely of boatmen and pilots, who have no other occupation than what is furnished by passing vessels through the reef, loading and discharging their cargoes. There are no artificers, and the bazar consists of a few shops for the sale of provisions only; destitute of the most common articles which are generally to be procured in every other part of the country.

Artificers we had no difficulty in procuring from other places, but, on a sudden call, it was impossible to advance the work by the addition of extra hands.

The total failure of the means provided for under-water explosions, also, was the cause of most serious inconvenience, and obliged me to alter entirely the plan of operations. Our supply of tin tubes would

have been expended in a few days, and, neither in this place, nor any where near it, could bamboos or reeds be procured. I was obliged to break up the canisters for containing the charges and substitute leather bottles in their place; this, with collecting the remains of the tubes after the explosions, has hitherto enabled us to continue the work. A supply of gun-powder must be received in a few days, there being but little remaining, which will necessarily stop the work, and a provision has I hope been made for this in time to prevent it.

Nothing, I trust, is now wanting to prove the certainty of success (if prosecuted) of this most important work, and though the extent of rock to be cleared is double what was at first supposed, still the expense will be trifling, in comparison with the advantages derived. If the testimony of the merchants of this part, and the masters of vessels, is to be taken, there is no public work now in progress looked on with more satisfaction than this.

1st April. The jumper, borer and shamrock, the latter a raft formerly used to remove the stones taken up by the windlass on the sapper, were out-boring to-day, with eight parties of sepoys—thirteen holes were made 2′ 9″ deep. The shamrock is not tarpaulined, but it worked very well. I sent out three catamarans to attend the sapper. The sapper and catamarans returned at 10 A. M., having done nothing. I laid down, at half past three A. M., eight more buoys to the southward, which nearly completes the right side—the total space included between them is 510 yards. Tried the current at half past two P. M.

S. reef 1st trial, feet 120′ in inches 50″ or $1\frac{5}{8}$ miles per hour nearly.
„ 2d do 120′ in do. 45″ or $1\frac{9}{11}$ do. do. do.
„ 3d do. do. do. 45″ do. do. do.
150 yards N. of N. reef 1st trial, feet 120′ in inches 45″ or $1\frac{9}{11}$ miles per hour nearly.
300 do. do. 2d do. 65″ or $1\frac{4}{11}$ do. do. do.
„ do. do. 3d do. 58″ or $1\frac{2}{5}$ do. do. do.

The two dhonies removed $48\frac{1}{2}$ tons of stone, measuring 728 cubic feet.

3d. The sapper, shamrock and borer proceeded to-day to the north of the northern reef. Eight men at the magazine raised one of the stones supporting the roofs, by means of two palmyra props and wedges; there was no foundation on which the props could rest; a stone sleeper was therefore placed at the depth of 5 feet. The two dhonies removed from the channel 43 tons of stone, measuring 730 cubic feet.

4th. There was great difficulty this morning in obtaining any divers. The men were consequently employed till nine A. M. in the small channel. Went out at seven A. M. with six leather cases, with

hose attached, lately sent by Captain Cotton; not one went off, but the hose had burnt to the nozle of the cases; there it must have been extinguished, from the suffocating effects of the oil mixed with the resin, and easily absorbed by the powder in the hose. At eleven A. M. fired off a 10-lb. case. The dhonies were not in use to-day.

5th. The borer and jumper were employed on the northern reef, but only made together six holes during the day. The buoys I took so much pains about have lost their distances, and two have had their numbers stolen by the dhonies passing to and fro. The two dhonies with the sapper removed from the channel 1295 cubic feet of stones, weighing 87 tons.

6th. There was no blasting to-day, the jumper and borer proceeded to the northern reef, where they made twelve holes during the day, three feet deep—56 tons of stone were removed from the large channel, measuring 860 cubic feet.

7th. The wall of the new magazine was completed with a doorway; part of the old roof has been removed, being excessively dangerous and constantly threatening to fall—74 tons of stone were removed from the large channel, measuring 1100 cubic feet.

8th. The jumper, shamrock and borer were all out to-day, and sixteen holes were made. The sawyers have been employed in cutting up planks for the paumben out of the pieces of jackwood sent to us from Ceylon. Thirty-eight tons of stone were removed from the channel, measuring 570 cubic feet.

10th. The jumper, borer and shamrock were all out to day in the large channel. The sawyers continued cutting up plank for the paumben. Eighty-six tons of stone were removed from the large channel, measuring 1290 cubic feet.

11th. The jumper and borer only were employed today—four sepoys were sent to the small channel—seven blasts were fired there to-day, which had great effect. There are, however, so many stones lying in the bed, as to form a serious obstruction to the larger description of cargo boats. I shall, therefore, use the small dhoney there, if it can be spared from the large channel—68 tons of stone were removed from the large channel, measuring 1040 cubic feet.

12th. As our powder is now nearly out, I am forced to limit the details of parties proceeding to the channel to blast. Twenty men were at the small channel today—the holes were fired off that had already been made. A great quantity of large stones are in the bed of the channel, that it would be necessary to blast, if required to drag them to any distance; but the small dhoney will be able to take them away without this additional trouble. One-hundred tons of stone were removed to-day from the large channel, measuring 1500 cubic feet.

13th. One dhoney was employed in the small channel, and did a great quantity of work; during the day a few more small blasts were fired, and 26 tons of stone were taken away, and out of the large channel 75 tons, measuring 1120 cubic feet. Besides the two dhonies and sapper, that are constantly employed in the large channel, I have lately kept the paumben at work in those places where fragments of stone have been blasted, and of these it takes away three or four heavy raft loads in the course of the day.

14th. The borer and jumper proceeded to the north of the north reef, where eight holes were made. The large dhoney, and sapper, with its tender, and shamrock, were employed on the southern reef, whilst the paumben proceeded to different parts of the channel in search of any loose fragments of stone. A party of sepoys were employed at the small channel with the small dhoney. They removed between them twenty-four tons of stone, whilst seventy tons measuring 1050 cubic feet were taken from the large channel.

15th. The small dhoney was employed at the small channel, and the latter is now quite free from obstructions of any kind. The large dhoney, with the sapper, removed from the main channel fifty tons of stone, measuring 750 cubic feet.

TABLE *of the Rise and Fall of the Tides, times of High and Low Water, and direction of the Currents at Pamban.*

Date.	Time of high water N. side of the reef.	Time of low water S. side of the reef.	Time of low water N. side of the reef.	Diff. between low and high water S. side.	Diff. between high and low water N. side.	Time the current changes from N. to S.	Time the current changes from S. to N.	Heightatwhich current turned from N. to S.	Heightatwhich current turned from S. to N.	Greatest difference of level of two seas.	REMARKS.
March 17	12 30 P. M.	9 20 A. M.	9 20 A. M.	7 In.	4 In.	3 15 P. M.	12 10 P. M.	1½ In	3½ In.	7 In.	A slight breeze sprung up at 8 A. M. from the N. E. by N. continued all day.
18	11 15 A. M.	7 10 ,,	7 34 ,,	8½	5	4 40 ,,	10 45 A. M.	2½	4	8½	do. do. N. E. do.
19	1 15 P. M.	8 40 ,,	9 0 ,,	10	6½	3 20 ,,	12 15 P. M.	3	4½	10	do. do. 11 A. M. do. do.
20	1 30 ,,	8 20 ,,	8 45 ,,	12	7½	5 0 ,,	11 30 A. M.	3	7	12	do. do. 9 A. M. N. E. by N. do.
21	2 30 ,,	8 0 ,,	8 20 ,,	1 11	9	6 15 ,,	11 5 ,,	4	10	1 11	A calm till 10 A. M. a slight breeze from the N. E by N. the rest of the day.
22	1 45 ,,	8 5 ,,	8 30 ,,	2 4	11½	6 30 ,,	10 45 ,,	4½	12	2 4	A very gentle breeze from the N. E. N. sprung up at 9 A. M. the wind during the morning varied from N. E. to W. by S. A spring tide this day; the current in the large channel running at 4½ knots per hour; small channel 3½ knots.
23	2 30 P. M	8 45 ,,	9 5 ,,	2 2½	1 2	6 30 ,,	11 30 ,,	7	10 0	2 2½	A slight breeze from the W. during the day.
24	3 45 ,,	9 10 ,,	9 30 ,,	2 9	12 0	6 15 A. M.	1 0 P. M.	7	1 4	2 9	do. do. N. the morning rather cloudy some appearance of rain.
25	3 20 ,,	9 0 ,,	9 30 ,,	2 11	1 5½	7 20 ,,	1 20 ,,	4	1 3	2 10	do. N. at low water the current in the small channel was running at 2¾ knots per hour.
26	4 20 ,,	9 10 ,,	9 30 ,,	2 7½	1 7	7 35 ,,	1 30 ,,	4	1 4½	2 7½	The wind has been very unsettled to-day, varying from N. E. to W.
27	5 0 ,,	9 45 ,,	10 20 ,,	2 5	1 5½	8 5 ,,	1 0 ,,	4	1 3	2 5	do. do. do. a few drops of rain at noon.
28	4 30 ,,	9 50 ,,	9 30 ,,	2 3	1 5	7 30 ,,	2 30 ,,	3	1 1	2 3	A calm till 12½ P. M. a fresh breeze; the N. E. sprung up and continued till after nightfall.
29	5 30 ,,	11 30 ,,	12 15 P. M.	1 10	1 5½	10 0 ,,	3 30 ,,	3½	1 3	1 10	A slight breeze in the morning from the N. freshened at 11½ A. M. and varying from N. to S. W.
30	5 40 A. M.	1 15 P. M.	1 40 ,,	1 6	1 2	10 30 ,,	0 0 ,,	4	0 0	1 2	The wind has been very unsettled, varying from N. to S. by W. the current did not change as usual from S to N.
31	5 45 ,,	3 10 ,,	3 50 ,,	1 4	10 0	0 0 ,,	0 0 ,,	0	0 0	1 4	The wind as yesterday—The current has continued to run from the S. all day.

Return of the Charges fired in the Pamban Passage during the Month of February 1837.

Date.	No. of holes	Average depth.	Diamr. of holes in in.	Line of least resistance.	Charges of each.	In what contained.	How fired.	
		ft. in.	ins.	ft. in.	lb. oz			
11	2	1 9	6	1 0	1 4	Qt. bottle	With 4 feet each of Bickford's hose.	Both blasts were surcharged, and besides a great many small fragments, four large blocks of stone were detached from the rock : they were fired simultaneously.
	1	1 6	3	1 6	0 8	Pt. do.	do. do.	Blew out the tamping, but split the rock.
	1	1 9	3	1 3	0 10	do. do.	do. do.	Produced a very good effect, and knocked off a large portion of stone into small fragments, fired simultaneously with the eight ounce charge.
	4	1 10	3	1 3	0 10	do. do.	do. do.	These four charges fired simultaneously produced a most excellent effect; there were two nearly out of water: the stone, within the range of these four blasts, was broken into small pieces besides some large blocks that fell into the channel, one stone of 3-lb. weight was projected to a distance of fifty yards. N. B.—Bickford's hose burns at the rate of a yard a minute nearly.
17	3	2 0	6	1 3	1 4	Qt. do.	With 5 of do.	These three went off with very good effect.
	4	1 6	3	1 0	0 10	Pt. do.	With 6 of the Engr. Serjt's. hose.	These four blasts fired, with the Engineer Serjeant's fuse have every one of them failed, but we managed to extract three of the bottles out of the four from the holes in which they were placed, the other was too tightly jammed.
18	11	1 9	3	1 3	0 10	do. do.	With 6 of Bickford's hose.	The effect of these was excellent ; the stone in many places was split into small fragments. One failure, and that the only one, proceeded from the fuse being placed in one of the bottles that had been taken out of the holes where they had remained all night ; the powder must have been slightly damaged for every particle of the hose down to the tamping had burnt. The small channel is now nearly completed to the desired depth and breadth.
	5	2 0	6	1 6	1 4	do. do.	do. do.	
25	1	2 6	6	1 6	3 0	Leather case	Bickford's hose.	The leather case was made in the shape of a bottle and well dammered over. One quart bottle did not explode in consequence of the fuse not having been fired, one was fired with Serjeant Reardon's hose and went off, one pint bottle was fired with the hose made at Madras and failed as usual. One quart bottle, the leathern case and the pint bottle with the same hose, were fired simultaneously—then one quart bottle and one pint bottle, and lastly three quart bottles, one proving a failure. The effect was very good, particularly where the leathern case had exploded, large pieces of stone being displaced—about twenty cubic feet must have been detached.
	5	2 0	6	1 6	1 4	Q. bottle	4 with Bickford's and the other hose made by Serjeant Reardon of the Sappers & Miners.	
	2	2 0	3	0 10	0 10	Pt. do.	With Bickford's & the other with the Engr. Serjt's. hose.	

Return of the Charges fired in the Pamban Passage from the 1st to the 31st of March 1837.

Date.	Numbers.	Depth of holes. ft.	in.	Diameter of holes. in.	Line of least resistance. ft.	in.	Charges. lb.	oz.	In what contained.	How fired.	
1	4	3	0	5	7	0	2	12	Leather bag	Bickford's hose.	One failed, but the cause not apparent, the hose had burnt to the powder, which was a little damp near the neck, without any visible opening; the others had an admirable effect and detached a large quantity of stone.
2	3	0	0	0	0	0	0	0	do	Bickford's	These charges were not registered, being on detached stones; the effect good.
4	6	2	6	4	7	0	2	8	Tin case	Portfire	Five were fired simultaneously, two failed from a tube being broken by the raft, the other had the portfire blown out by the concussion, the others were reprimed and exploded singly with good effect—the stone in some places heaped up to the surface.
	1	2	6	6	7	0	7	0	do	do	
	7	2	0	3	6	0	1	4	do	do	These were in the small channel, five were fired simultaneously, a method we now abandoned, as only one took effect; the portfires being started by the explosion of the first, they were then reprimed and fired in succession; the portfire of one went off on being lighted.
6	12	2	6	4	6	0	3	0	Leather case	Fuse sent from Madras	The fuse was divided into lengths of ten feet, but all went out, with the exception of one which exploded after 22 minutes: the oil covering the surface of the fuse appears to have penetrated to the powder which will not answer even out of water.
7	7	3	0	6	7	0	7	0	Tin case	do	Employed the fuse as a substitute for portfire; two cases failed from some powder being in the tube which burst them without firing the charges.

Return of the Charges fired in the Pamban Passage from the 1st to the 31st of March 1837.

Date.	Numbers.	Depth of holes.		Diameter of holes.	Line of least resistance.		Charges.		In what contained.	How fired.	
		ft.	in.	in.	ft.	in.	lb.	oz.			
8	2	6	0	6	7	0	7	0	Tin case	Quick match	One case failed, being broken by the boatmen in pulling down; all the other exploded with good effect.
	3	3	0	3	7	0	2	8	do	do	
	1	3	0	3	7	0	3	0	Leather case	do	The leather case had been nearly cut through in tamping—water penetrated the powder.
9	3	3	0	6	7	0	7	0	Tin cases	do	One tin case failed, from the joint having been imperfectly soldered, one leather case from too much resin having been put into the dammer; the remainder had a very good effect.
	4	3	0	3	7	0	2	8	do	do	
	3	3	0	3	7	0	2	8	do	do	
10	3	3	0	6	7	0	7	0	do	Pipes & quick match	All the charges were fired separately, but the failures were greater than usual from the quick match having been injured, and the tube not perfectly light—the effect on the whole good.
	5	3	0	3	7	0	2	8	do		
	4	3	0	3	7	0	4	1	Leather cases	do	
11	3	2	6	3	7	0	2	8	Tin cases	do	All exploded with very good effect, but the 6-lb. charges were rather too great for the stones, which were broken into small pieces, occasioning greater trouble in removing.
	5	2	9	5	7	0	6	0	Leather cases	do	
13	4	2	6	6	7	0	6	0	Leather cases	do	The whole of the charges answered, though several required being primed again from the quick match going out—ultimately all were fired. The leather bags answered admirably, from giving to the uneven surface of the stones.
	5	2	6	4	6	0	4	8	do	do	
	3	2	6	6	7	0	7	0	Tin cases	do	
	1	2	6	3	6	0	2	8	do	do	
14	1	2	6	3	3	0	4	0	Leather case	do	All succeeded, and great masses of stone were thrown up high above water.
	2	2	0	6	5	0	7	8	do	do	
	4	2	6	6	5	0	7	0	Tin case	do	
	6	2	6	3	4	0	2	8	do	do	

15	6	2	6	3	4	0	2	8	do	do	The charges all answered, one very large stone was projected a distance of one hundred yards.
	4	2	6	6	6	0	7	0	do	do	
	5	2	6	6	6	6	6	$3\frac{1}{2}$	Leather case	do	
16	1	2	6	6	5	0	6	14	do	do	The current was exceedingly strong; one charge only failed, though several had to be relighted several times—a dangerous experiment. The 10-lb. charges had less apparent effect than the 7-lb. and may be accounted for as having a greater depth of water.
	1	2	6	6	7	0	10	0	do	do	
	3	2	6	6	6	0	7	0	do	do	
	1	2	6	3	5	0	2	8	do	do	
17	1	2	6	6	7	0	10	0	Tin case	do	Eleven charges were fired with the hose and quick match, the remainder with hose and small pieces of portfire attached to the end, which fell down the tube when lighted. This answered when the tubes were perfect, but if it met with any obstruction, the air sometimes blew it out. The charges were all ultimately fired and the effect good.
	4	2	6	6	7	0	7	0	do	do	
	11	2	6	3	5	0	2	8	do	do	
	3	2	6	3	5	6	2	14	Leather case	do	
	3	2	6	6	6	0	4	$10\frac{1}{3}$	do	do	
	2	2	6	6	7	0	7	5	do	do	
20	4	2	6	6	7	0	6	11	do	do	Two failures occurred to-day, from being obliged to use old tin tubes saved from the former explosions; some of the portfires were blown out by the air being suddenly exhausted by the heat of the portfires. On the whole the effect was good and no powder lost, having recovered the two cases, the powder dry though many hours under water.
	9	2	6	3	6	0	2	8	Tin case	do	
	2	2	6	6	7	0	7	0	Leather case	do	
21	2	2	6	6	7	0	10	0	do	do	One 10-lb. charge failed from the rapidity of the current which broke the tube, all the rest were exploded to the south of the reef.
	3	2	6	3	5	0	2	8	Tin case	do	
	5	2	6	6	6	0	4	$6\frac{1}{2}$	do	do	
22	2	2	6	6	7	0	10	0	Leather case	do	Employed quick match with a weight leading down to the powder, and two strings, one to light the other if it goes out.
	4	2	6	6	6	0	4	$5\frac{1}{2}$	Tin case	do	
23	4	2	6	6	7	0	10	0	do	do	Water perfectly transparent, could see the least stone at the bottom; found we were on a bed or field of levelled rock of a hundred feet in breadth; the charge of 10-lb. blew the tamping, and rose a column of water about thirty feet high, recharged with the same quantity of powder the holes still remained. The same having increased in depth about one foot, very little effect produced by the explosions; ordered the holes to be made five feet.
	4	2	6	3	5	0	2	8	do	do	
	1	2	6	6	5	0	5	2	Leather case	do	

Return of the Charges fired in the Pamban Passage from the 1st to the 31st of March 1837.

Date.	Numbers.	Depth of holes. ft.	Depth of holes. in.	Diameter of holes. in.	Line of least resistance. ft.	Line of least resistance. in.	Charges. lb.	Charges. oz.	In what contained.	How fired.	
25	9	2	6	6	7	0	5	$11\frac{4}{9}$	Leather case	Pipes and quick match	These charges fired off the bed of rock, and with tolerable success; all exploded and much stone broken. Three heavy charges fired which made craters but no fracture in the field of rock; fired two small charges round these holes which enlarged them sufficiently for work.
	4	3	6	6	7	0	10	0	Tin case		
	4	3	6	3	7	0	2	8	do	do	
29	2	2	9	3	6	0	2	8	Tin case	do	Every ounce of powder had its proper effect; large stones were hurled to some distance in the air, but the stone is of a compact quality.
	7	2	9	6	6	6	6	$2\frac{4}{7}$	Leather case	do	
30	3	2	9	3	6	0	2	8	Tin case	do	Commenced blasting at 11 A. M. on the southern reef; the effect was excellent—we finished at 3 P. M. The jumper and borer were very unfortunate in their work to-day. In the morning the raft had been placed on a sand bottom, and only one hole was completed; in the afternoon the current was too strong for the divers.
	8	2	9	6	6	0	5	$6\frac{1}{2}$	Leather case	do	

Return of the Charges fired in the Pamban Passage from the 1st to the 15th of April 1837.

Date.	Number.	Depth of holes. ft.	Depth of holes. in.	Diameter of holes. in.	Line of least resistance. ft.	Line of least resistance. in.	Charges of each. lb.	Charges of each. oz.	In what contained.	How fired.	
1	5	2	9	3	6	0	2	8	Tin cases.	With quick & slow match.	The effect was remarkably good; the first six were fired on the southern reef and the two others ninety yards to the south of the northern reef.
	3	2	9	6	6	0	4	$10\frac{2}{3}$	Leather case.	do	
3	1	3	0	6	7	0	10	0	Tin case.	Quick & slow match.	Four blasts were fired a little south of the northern reef—nothing but compact sand—the intervals between the holes were, however, completely blown away, the other five were fired opposite to No. 8 buoy; ninety yards north of northern reef; the effect was good, the stone having but slight adherence, split into numberless fragments, but the intervals between the holes were completely blown away.
	3	3	0	6	6	6	5	0	do	do	
	5	3	0	6	6	6	5	$13\frac{4}{5}$	Leather case.	do	
5	2	2	9	3	6	0	2	8	Tin case.	do	Three blasts took place opposite No. 2 buoy 270 yards north of the northern reef, the next three were a little to the north of No. 4, the next one was opposite No. 5, and broke the other two holes by the explosion, and the next four were between No. 8 and 9; the effect altogether was very good, the bed of the channel was ploughed up in those places where the blasts took place. The intervals between the holes were entirely blown away, and some stones of a quarter of a ton in weight were displaced.
	7	2	9	6	6	6	5	0	do	do	
	2	2	9	6	6	6	10	0	do	do	
7	2	2	10	3	6	0	2	8	do	do	The stone was split into small fragments there were very fine size, but the lined intervals were blown away.
	7	2	10	6	6	0	5	0	do	do	
	5	2	10	6	6	0	5	5	Leather case.	do	
8	1	2	10	6	8	6	10	0	Tin case.	do	Three blasts were fired eighty yards south of the north reef; the effect most excellent, three or four stones of two tons in weight were thrown considerably above the surface of the water. The other six, fired on the southern reef, removed a great quantity of stone.
	1	2	10	3	6	6	2	0	Leather case.	do	
	7	2	10	6	6	6	6	$10\frac{4}{7}$	do	do	

Return of the Charges fired in the Pamban Passage from the 1st to the 15th of April 1837.

Date.	Number.	Depth of holes.		Diameter of holes.	Line of least resistance.		Charges of each.		In what contained.	How fired.	
		ft.	in.	in.	ft.	in.	lb.	oz.			
10	7	2	10	3	7	0	2	8	Tin case.	Quick & slow [match.	The effect was good, although the stone was broken into small fragments; one case failed to-day from the quick match bursting the tube at a part where it had not been soldered.
	6	2	10	6	7	0	6	$4\frac{2}{3}$	Leather case	do	
11	1	2	10	3	6	6	2	8	Tin case.	do	Four charges were fired a little to the south of the southern reef, the effect was very good, and large blocks of compact sandstone were detached from the bed, the other nine blasts were fired on the northern reef, the stone being considerably soft.
	12	2	10	6	6	6	6	0	Leather case.	do	
12	6	2	11	6	7	6	5	$2\frac{2}{3}$	do.	do	Two blasts were fired 100 yards to the north of the northern reef, the rest 140 yards N of N reef. The effect produced was very good; the holes are now made considerably deeper than they used to be, and I do not think it exaggeration to assert that after a certain depth the effect increases in a greater ratio than the cubes of the same depths.
13	4	2	10	6	7	6	5	14	do.	do	Four charges only were fired off to-day about 50 yards south of the north reef. The effect was good but the stone was broken into small fragments.
14	1	2	11	3	7	6	2	8	Tin case.	do	Five blasts were fired 120 yards north of the north reef, and the effect was very good; some stones of pretty large dimensions were detached. The rest were fired 150 yards north of the north reef; two had an excellent effect, and the other three blew the stones into large fragments.
	9	2	11	6	7	6	5	$4\frac{4}{9}$	Leather case.	do	
15	10	3	0	6	9	6	5	$13\frac{2}{5}$	do.	do	One blast was fired 40 yards N. of N. reef another 120 yards N. of N. reef, and the rest 180 yards N. of N. reef, they all went off and produced very good effect, with the exception of one, the tube of which burst.

XI.—*Remarks on the use of Captain Kater's Altitude and Azimuth Instrument.* — *By Lieutenant* J. Campbell, *Assistant Surveyor General.*

In the 20th volume of Jamieson's Edinburgh new Philosophical Journal, Mr. Galbraith has given a paper upon the powers and use of Kater's circle, which appears to be the first account of the instrument published.

After shewing the degree of accuracy with which astronomical observations may be made with so small an instrument, Mr. Galbraith remarks : " the deductions from these small but compact instruments are much more accurate, therefore, than from their size we had any reason to expect, and may be advantageously employed in many geodetical and astronomical operations with great success. Hence, the smaller sized ought to recommend themselves to scientific travellers, and to medical officers attached to foreign stations, who are anxious to distinguish themselves in geographical and astronomical researches."

The dimensions of one of these small circles in my possession, made by Robinson, of Devonshire-street, Portland-place, London, are as follows :—

The case is nine inches high and five inches square at the bottom, and, having pieces of brass for the levelling screws let into the top, it serves upon occasion as a stand for the instrument. The circles are three and a half inches in diameter, cut to 30′ on a silver arc. The vertical circle has two verniers which read to 1′, and the azimuth circle has three verniers which also read to 1′. The level is fixed to the back of the vertical circle. The telescopes are achromatic and magnify seven times, and the one attached to the vertical circle is fitted with two negative eye-pieces, one of which is diagonal, and a dark glass is adapted to each; this telescope has *four* wires, one vertical and three horizontal, which are convenient in taking altitudes, because a mean of three observations may be obtained without touching the instrument.

A stand with three legs, like that of a theodolite, with a plate to receive the adjusting levelling screws, with another to embrace the upper part of the screws to hold the instrument firm, would be a convenient support on some occasions, but a small table, or a bullock trunk, makes a very good stand, when no better is at hand.

The pocket box sextant is the only instrument which can be compared with the circle for portability, and that requires the aid of an

artificial horizon, and, consequently, no altitude can be taken with it above 60°—unless the instrument is made with a second index glass at right angles to the first, and has dark glasses fitted to the second eye hole, when it may be used to measure the sun's altitude when in the zenith with the meridional horizon, and in fact becomes a sort of portable zenith sector. Let A (Pl. 4, fig. 2) be the sun's place near the zenith, B the artificial horizon, and C the place of the eye, and the angle measured by the sextant, then will the sun's zenith distance be equal to half the angle A B C or

$$= \tfrac{1}{2} (180 - L\ C)$$

$$O',\ Z\ D = 90 - \tfrac{1}{2}\ C.$$

In using the circle, Mr. Galbraith says that Captain Kater has observed the latitude by a *single* observation of the pole star, with only a maximum error of —26″.

No doubt in the hands of so scientific an officer as Captain Kater, the instrument would be made to give more exact results than when used by other persons, but, without attempting to arrive at so much nicety, the instrument from rough observations, such as are likely to be made by travellers, can give results practically very useful, without wasting any more time that would be required with larger instruments.

The following observations for the latitude of Calingapatam were made by reducing the altitude of the sun's lower limb to the meridian by a common watch, the error of which was found by equal altitudes a quarter of an hour before and after the meridian passage.

1st	mean of	12	altitudes.	=	18°	19′	32″	N.
2d	do.	13	do.	=	18	19	34	
3d	do.	8	do.	=	18	19	55	
4th	do.	9	do.	=	18	19	9	
5th	by a watch without a second, wanting for the seconds.							
	Mean of 6 altitudes.			=	18°	20′	17″	

The three latter observations were made very roughly to ascertain the maximum error possible to take place. In these observations all the work was concluded in 30 minutes, including the observations for equal altitudes.

Had a pocket chronometer been used, the results would doubtlessly have been much more exact, for an error of 8″. in the time, gives an error of 1′ in the latitude, if the hour angle is 20 minutes, as may be found by differencing the formula for reduction.

$$= \frac{2}{\sin 1''} \overline{\sin}^{2} \tfrac{1}{2} P.\ \cos.\ \text{dect.}\ \cos.\ \text{lat.}\ \text{cosec}\ Z\ D$$

Error $= \sin \tfrac{1}{2} P.\ \cos.\ \tfrac{1}{2} P.\ \dfrac{\cos.\ \text{lat.}\ \cos\ \text{dec.}}{\sin\ Z.\ D.}\ .\ 2\, x''$ when x'' is the

error of the hour angle in seconds of space.

In surveying extended tracts of country, the circle may also be used with advantage, for, small as it is, from the fineness of its wires and steadiness, it is capable of as much exactness as those lumbering instruments the theodolites, as generally constructed in England for land surveying, beyond which purpose they are fit for nothing. In measuring six horizontal angles round a station, each angle being measured on a different part of the circle, after moving the instrument, the sum was but little less than 360° viz. = 359° 1′ 0″; whence it appears the instrument will measure an horizontal angle with only a maximum error of 10″, a degree of exactness to which no theodolite can generally approach.

From the readiness with which it gives accurate results for the latitude, the circle when used in surveying would make very apparent the error caused by neglecting the difference of latitude between the foot of the perpendicular and the parallel, or by taking the distance from the perpendicular as the difference of latitude, as is sometimes done in rough work. The amount of this error is shewn by the subjoined table computed from the formula.

$$\text{error} = \tfrac{1}{2}\ \pi''^{2} \cdot \text{tang.}\ \lambda.\ \sin 1''$$

when π'' is the perpendicular in seconds of the equator, and λ' the latitude found by turning the distance from the perpendicular into seconds by Lambton's table.

Table of the error always subtractive from λ.

λ	PERPENDICULAR.					
	30′	1° 0′	1° 30′	2° 0′	2° 30″	30° 0′
5°	1″	3″	8″	11″	17″	25″
10	1.4	5	12	22	35	50
15	2	8	19	34	53	76
20	3	11	26	46	71	103
25	4	15	33	59	91	132
30	5	18	41	72	113	163

Now, as the error likely to be committed in using an indiffernt instrument is not likely to be more than thirty feet in sixty miles, the error, as shewn in the table, is too great to be neglected. This error may be more conveniently applied by computing a table in which as

a function the error is given of the difference of longitude, by changing the formula.

In the diagram (Pl. 4 fig. 3) let A D be the meridian of the first station, B C the perpendicular of any other station, then A being the pole, D C will be the parallel of latitude of C, and A D will be the co-latitude of E, and not A B, and B D will be the error or the difference of latitude between the foot of perpendicular and the parallel.

$$\text{Take}\quad AB = 90 - \lambda$$
$$BC = \pi$$
$$AC = 90 - (\lambda - x)$$

$DB = x$. then by right angled spherics we have

$$\sin(\lambda - x) = \sin\lambda \cos\pi$$
$$\sin\lambda.\cos x - \sin x.\cos\lambda =$$

dividing by $\sin\lambda$ we have

$$\cos x - \sin x.\ \cot\lambda = \cos\pi$$

and the $\cos x$ being nearly $= 1$, and substituting the value of $\cos\pi$

$$1 - \sin x.\cot\lambda = 1 - 2\sin^2\tfrac{1}{2}\pi$$
$$\sin x. = 2\sin^2\tfrac{1}{2}\pi\ \text{tang}\ \lambda$$

and taking x'' and π'' for the sines

$x'' = \frac{1}{2}\pi''^{\,2}.\ \text{tang}\ \lambda.\ \sin 1''$ which is the formula before given,—but the angle B A C is the difference of longitude between B and C, and in the right angled triangle A B C

$$\text{Tang A} = \text{tang}\ \pi.\ \sec\lambda$$

$A'' = \pi.\ \sec\lambda$ and transposing

$$\pi'' = \cos\lambda.\ A''$$
$$= \cos\lambda.\ \text{diff. longitude}$$

substituting this in the last formula

$$x'' = \tfrac{1}{2}\delta''^{\,2}.\cos^2\lambda\text{- Tang}\ \lambda.\ \sin 1''$$
$$= \tfrac{1}{2}\delta''^{\,2}.\cos\lambda.\ \sin\lambda.\ \sin 1''$$

or become $\cos\lambda.\ \sin\lambda = \frac{1}{2}\sin 2\lambda$

$x'' = \frac{1}{4}\delta''^{\,2}\cdot\sin.\ 2\lambda.\ \sin 1''$ from this formula the following table is computed x always subtractive :—

λ	DIFFERENCE OF LONGITUDE.					
	30′	1° 1′	1° 30′	2° 0′	2° 30′	3° 0′
5°	1″	3″	6″	11″	17″	24″
10	1	5	12	21	34	48
15	2	8	18	31	49	70
20	2	10	23	40	63	91
25	3	12	27	48	75	108
30	3	14	31	54	85	122

By using a table of this kind, the error may be corrected without any additional trouble, or wasting time in the niceties of the computation by the formula; if it is ever necessary to undertake a survey of any extent with the small circle, or to use inferior instruments, when others cannot be procured.

In sketching in a hilly country, like those which are common among the mountainous tracts of India, when it is difficult, and sometimes impossible, to ascend to the summit of hills, from the impenetrable jungle which generally clothes the sides, the circle becomes a very useful instrument, from the facility with which azimuths of the sun or moon may be taken with it; by which means an azimuthal triangulation may be carried on, with as much readiness as with a circumferentor, but with infinitely greater exactness.

In using the circle in this way the subjoined diagram will explain the method of operation.

Let A (Pl. 4 fig. 4) be the plan of a camp, from whence the hill stations D and C can be seen. Let B be a little hill from where D and C can also be seen. Let the distance A B be assumed as a base, and the distance guessed by the perambulator. Let the latitude be exactly ascertained at A, and also the angles B A C and B A D be measured from A, and also the angle between B and the sun's centre. Let the angles A B D and A B C be observed from B, then with the base A B the distance D C may be computed. From E, another camp beyond the range of hills D C, let the angle D E C be measured, and also the angle between the sun and one of the stations D or C. Then, if M express the meridian, the angle M E C being known, the angle M C E is also known, from the azimuth at E, and also the angle M C D from the azimuth at A, and, the distance D C being given, the triangle D E C may be computed. Again if F is another camp, separated from F by another range of hills, but from D and C can be seen, D E and C E can be computed in the same manner, and from E and F more points as G &c.

may be laid down, and the survey thus carried on without losing time in climbing hills, and the district may be sketched in while proceeding from camp to camp. After the detail has been completed, another observation for the latitude at the extreme of the survey in latitude, will give the difference of latitude between the last station and A, with an error of not more than 1000 feet at the utmost, and then from comparing the true difference of latitude with the computed difference from the assumed base, the true length of the sides of the triangles and the base may be found, without the trouble of measuring a base, even if a piece of ground to measure it on could be found in such a country.

XII.—*Observations on Professor* Wilson's *Historical Sketch of the Kingdom of Pándya, in the Sixth Number of the Journal of the Royal Asiatic Society.—By the Rev.* Wm. Taylor, *Member of the Madras Literary Society, and Auxiliary Royal Asiatic Society.*

The Editor of the Madras Journal of Literature and Science has been so kind as to refer No. 6 of the Journal of the Royal Asiatic Society to me, with a special indication to articles ix. and xix., affording me the opportunity of adding any remark respecting them. For this polite and gentlemanly mode of proceeding I feel deeply obliged, while I judge it to be expedient to avail myself of the privilege so accorded. It has also yielded me no small measure of satisfaction to find that any imperfect labours of mine attracted the attention of the Boden Professor of Sanscrit at Oxford; and were honoured with any remarks, in the way of discussion, from one so profoundly versed in the ancient classical language and history of the more northern portion of India. In the two volumes of Translations to which his observations refer, I am fully persuaded that there are so many indications of my very respectful esteem for that learned individual as not to need any laboured reiteration in this place: but I may express some regret, that, in cases wherein I somewhat differed from his conclusions, I had not more scrupulously weighed the exact force of every word, not merely as it would bear on the impressions of others, for they would readily perceive the respect which pervaded the writer's mind; but also as it might influence the person whose deductions were immediately concerned. The Professor will, I trust, pardon me any error, or indiscretion, or want of caution, of this kind, if it occurred, as possibly it may have done; and will in re-

turn receive the assurance that, on this ground, I very readily coincide in the propriety of his laying his hand a little heavily upon me, at the close of his note, to which in due order I purpose to add some further explanation.

I would now briefly notice in the same order the topics adverted to by Professor Wilson. The Madura St'hala Purana, of my Translations' and the Madura Purana of his documents are the same work. The " Pandion Chronicle," of my work, a name given by myself for distinction sake, is, to the best of my knowledge and belief, not to be found among the Mackenzie MSS. any more than the original of the " History of Karnata Governors;" but of this last the translation by Mr. Wheatley indicated No. 23 in the list at the end of article IX, is no doubt from that original. I have by me a rough translation on country paper of that MS. in Mr. Wheatley's own hand-writing, and, from respect to his memory, I went so far as to have a fair copy made from it, for the use of the press ; until, in the actual comparison of the original and translation, I found the latter too paraphrastic to represent the original on my plan of proceeding, which was to give the original and translation on parallel pages, and to annotate or paraphrase afterwards : a mode of proceeding which I still decidedly prefer; because the errors of an annotator, if he fall into such, can be corrected, but a verbose, or paraphrastic, or indeed any thing except a close and literal, translation, corrupts the springs of knowledge at their source, and introduces error in its most specious, and with difficulty to be distinguished, form. I have the most perfect respect for Mr. Wheatley's talents and fidelity in saying so—for it was only in the just principles of translation that he erred ; nor have I a particle less of entire respect for Professor Wilson in saying, that he has been susceptible of error, and in some instances I think has been mistaken from this source of erroneous deduction.

Adverting to the comparative antiquity or otherwise of " the chronology of Pandyan history," I now very readily state, as the result of more extensive enquiries, since I published the two volumes of translations, that I am prepared to yield considerably in the claims of antiquity which I had assigned to some events in the *Pandya* history. Something must turn on the question, whether the foundation of Madura was antecedent to the visit of Rama of Ayodhya to Ramesuram as the Madura Purana asserts, or whether it was posterior, as Professor Wilson, guided by a translation from one manuscript, had stated. I would however just in this place, leave the matter as Mr. Wilson has left it : remarking only that a single inscription of any grant by *Kuna-Pandiyan* with a distinct date, should we be able to meet with such a thing, would do more towards settling the question than a volume of mere dissertation.

With regard to the particular MS. and that passage of it which now stands forth so prominently, I could wish that the expression quoted by Professor Wilson had been softened. Being cut out from its connexion and printed in italics, it reads harsh, whereas the whole paragraph in the Prefatory Notice to the 2d volume of translations, would I suppose be by all admitted to be deferential in no ordinary degree. Every sentence, or member of a sentence, of any writer may be so used; but it is I believe an axiom among critics, that any expression so excided is not to be taken as indicating the spirit or meaning of the entire context. The point of the question is this, that several authorities traced up the lineage of the most early rulers of Madura, to a particular son of a particular patriarch (so to speak) among the ancestors of the *Hastinapuri* race of kings. The position assumed by Professor Wilson, if accurate, at once nullified the whole of these authorities. The particular passage is (Descriptive Catalogue vol. 1, p. lxxiv.)—"the founder of the (Pandya) kingdom according to the local traditions, was a person named *Pandya*, a native of Oude, and of the agricultural caste." But "the local traditions" as indicated by me (Oriental Historical MSS. vol. 2, Ap., p. 35) did not, to the best of my judgment, direct to such a statement; all my authorities were against it; and on tracing the matter minutely in the Descriptive Catalogue, the statement, or rather something like it, was found only in one MS. in the account of which (Descriptive Catalogue vol. 1. p. 188,) it is said, "amongst these (pilgrims) was *Mathura-náyaka Pándya** a man of agricultural tribe from the north of India, who colonized the country along the *Vygi* river and founded the city of Madura." The MS. itself on being examined did not fully bear out this statement; and that circumstance was mentioned, on its being discovered, in the simplest possible language, in a short note (Oriental Historical MSS. vol. 2. Ap. p. 39), of which Professor Wilson has used only the concluding words. The particular point turned on the word "Oude," and on the word "*Pandiya*," as denoting a man, or person so called, as a proper name, which two things are not borne out by the manuscript, and the importance of the discrimination rested in this fact, that if the position chosen by Professor Wilson was just, then all other authorities were wrong: a matter of some consequence to the discussions in which I was engaged. I may add that in the original of the MS. in question the translation which I gave in the above note, of *Vada désattilulla pándiyanákira vellázhan*, might have been still better and more accurately rendered "an ancient agriculturist in (or of) the north country." As before ren-

* Being translated, "the Madura lord Pandya."—W. T.

dered the specific country "Oude" was set aside, and the term Pandyan made an appellative (as it is truly is) and *not* a *proper name.* I was not then so perfectly conscious that the appellative *pándyan* should be translated "an ancient:" it was the Telugu language in which *pánta* as an adjective for *old* is familiarly common, which first brought the circumstance to my notice. In Tamil that word is now obsolete, though formerly in common use. I must add my conviction that the manuscript in question, as a compilation by a Christian servant of Colonel Mackenzie, has no claims to be regarded as an authority; but as the proof of this position could only arise from a translation of this MS. and also of the *Chola Désa Púrvika Cheritra*, by the same writer, I must rest that position for the present only on my own assertion. I regret that my very innocent use of the word "information" should have been construed into an "assumption—implying it is to be inferred verbal information:" it is properly the inference that is "gratuitous and mistaken," seeing that the assumption was never made. I had attentively read the Introduction to the Descriptive Catalogue, and could not but be aware of the statements contained p. xviii---xxi, quite sufficient to prevent any idea of the author's depending on mere verbal statements. I have yet to learn that the word "information" used in the Prefatory Notice to the 2d vol. O. H. MSS. is limited to *verbal* information; but if the inference were in any measure founded on what appears in vol. 2. p. 63., then I can appeal to that whole paragraph; borne out as it can be shewn to be by the Introduction and Catalogue: and, conscious of inward rectitude, and outward substantial accuracy, would solicit the Professor not to be needlessly annoyed by differences of opinion, which in the fair fields of literature when candidly and openly stated, are never considered to be censurable; but I expressly recall the words "verbal accounts of natives" in p. 63. because, without any allusion to that page, Professor Wilson has contradicted it indirectly, as if implied by the word "information" in the Introduction. That "the translations were the work as frequently of European as of native scholars as specified in the list attached to the sketch," is, most candidly speaking, not borne out by that list, wherein out of twenty-eight documents, the names of only one European translator is given, that is to say the name of R. Clarke, Esq. I readily add Mr. Wheatley as a second (though a slight inaccuracy is involved); for the rest either no names, or the names of natives, strictly such, appear. Now I trust the Professor will consider me not uncandid, when I make no comment on this discrepancy; but I must further add that in the Introduction to the Des: Cat: p. xxi, it is stated---"with a very few exceptions the translations are the work of natives alone." I bow with extreme deference to the name and authority of R. Clarke, Esq. who was here one of the best Tamil

scholars of his day; but in the first place it is perfectly well known that European gentlemen of Mr. Clarke's rank do not servilely labour at translations themselves, the rough work always being done for them by natives; in the second place I am sure, arguing *à priori* from the above reason and *á posteriori*, from the false translation ascribed to him, that Mr. Clarke did not write that passage, while his eye rested on the original paper, and his hand traced the alleged rendering by him---it would be a libel on that gentleman to say so; though it is none to presume that, in the general way, he may have passed and authenticated the translation by his signature, without reference to critical niceties; in the third place, I pledge myself that the exact words of the original manuscript represented in Roman characters, are given above, and not all the learning, ingenuity, and talent, even of Mr. Clarke could render them fairly in any other way than I have done. For these three reasons, to adduce the mere authority of a "*magnum et venerabile nomen*," as set off against a false translation, or to confirm a conclusion based on an erroneous one, is in my view irrelevant to the question.

If, quitting this particular instance, there were any person's translations that I would admit, it would be those of Mr. Wheatley, whose office and profession was that of a translator, not solely *de nomine* but *de fide*; yet his principle of accommodating to the ideas of Europeans, and paraphrastic rendering, comports not with my principles of translation; nor with, abstractedly speaking, correct principles of translation: if so without knowing any thing of Mr. Clarke's labours, what opinion could I antecedently have formed of native translations for Col. Mackenzie, of a portion of which in the Professor's own words, "the "value* is much diminished by the very imperfect manner in which "they have been executed, the English being frequently as unintelligi- "ble as the original: with a very few exceptions, the translations are "the work of natives alone."

I am bound to give the Professor considerable praise for the tact with which he handles an advantage given to him by a passing expression concerning the Supplementary Manuscript, which it is added, "we consider as trustworthy." But this expression is cut out from the context, as noticed before in a similar case, and so obtruded, by no means gives the sense of the entire connection in which that expression is found. It occurs, vol. 2 p. 75 while at p. 72, the particular discrepancy quoted by the Professor is discussed; the fictions (universal among *Hindus*) as to the long reign of *Vicramaditya* are also sifted, and reduced to something like order in various parts of the work: in p. 73 it is said "Vicramaditya ruled in reality about a hundred years," a large allowance by the

* Des; Cat: Intro: p. xxi.

way. The statements of the supplementary MS. were by no means implicitly taken; dates in MSS. are sometimes faulty from transcription, but a translator cannot alter them; and finally though a prevailingly favorable opinion is given of the Supplementary Manuscript, yet a doubt at p. 76 plainly appears, whether its testimony can be maintained, and at p. 77, the " submitting the evidence of manuscripts implicitly to the test" of the author's " own discretion," is expressly declined, and judgment left with the readers. Professor Wilson is quite right in exercising his judgment and discretion; and only unfair in his mode of treating the translator and commentator. That five names will not do for the record of 3000 years is certainly true; such a position of the Supplementary Manuscript was not intended to be designated as " trustworthy :" it was expressly noted unfavourably; but the Professor certainly knows that all *Hindu* accounts of Vicramaditya are extravagant; and the simple truth probably is, that, under the guise of a miraculously long reign, they wish to cover over a period disastrous to *Hindu* ascendancy, and derogatory to their country's glory. Accurate records of that period must be sought for elsewhere, and not from among the *Hindus.*

Being fully disposed to admit and believe that among the manuscripts of the Mackenzie collection there are many valuable documents, more so certainly than the Supplementary Manuscript, I shall hope to see the whole brought into full development. Abstracts, however they may serve to give a general idea, will not suffice in critical, or doubtful cases: either the original, or else a faithful, literal, and critical, translation becomes then indispensible. On this plan it would give me pleasure to be able to consider my previous humble researches with chiefly my own materials, as a sort of vestibule to the Mackenzie temple; or, if the idea may be better, as a porter's lodge to the park and mansion of a peer of the realm.

Adverting to the " Historical Sketch of the kingdom of *Pandya*" (Art. 9, No. 6, J. R. A. S.) it is not without great hesitation that I make any remarks; as far as personal considerations are concerned, I certainly would avoid doing so; but there is some tone of dictation and confidence in the Professor's manner; his name and authority confer of themselves a sanction of his statements; and hence a few comments may prevent mistakes in others, and ultimately subserve an important public object which I purpose to announce in the sequel. These considerations, chastened by the most entire respect for the high attainments of the Professor in Sanscrit literature, will guide my observations.

It is not strictly accurate to restrict the meaning of the term *Dravira désam* to "the extreme southern portion of the east-part of the peninsula," a definition which is besides so loose that it must in strictness exclude the *Chola desa* and *Chera desa* which it professes to include, and shut out all, but the *Pandya-desa*, which alone and by itself answers to the definition. The *Dravida-désa* would answer to our familiar use of the term Peninsula as regards extent. The common division, in reference to languages, which is made by intelligent natives into the *Panja-gauda*, and *Panja-dravida*, gives to the latter a measure co-extensive with the more classical term *Dacshin*, or the south. I am acquainted with one native authority which limits the term *Dravida* to the country wherein the Tamil language is spoken, fixing the northern boundary at *Tripeti*. Extreme minuteness of remark is not in this particular of consequence. A little further on the Professor has the following statement. "An adventurer named Pan-" diya of the *Velálar*, or agricultural tribe, first established himself in " that portion of the south to which his name was afterwards assigned." To this sentence is appended a note which gives the native *Hindu* statement, heretofore followed by me, by adducing the *Hari vansa* and *Agni Purana* as affording another, and as I conjecture better, account than the above; but rejecting their authority, as far as I can perceive, for no other reason than the silence of the *Vishnu Purana*, or an omission in its genealogy. But it is an established axiom in sound criticism that an omission is not a contradiction. The statement which the Professor has thought fit to prefer to the native accounts has been before sifted, and disproved. It may be as well, notwithstanding, where to introduce a faithful translation of the context in which the discussed, and disputed, passage occurs; which is the following:

"That same *Rama* the king of *Ayodhya* making himself responsible, that the lying-legend *(Poyyána-purana)* which he had made concerning this place called *Ramésuram* was the true way to go to (attain to) heavenly bliss (*Mòcsham*) and having disseminated it widely in the north country, and in other countries, the people of all countries with great intensity of thought (zeal, or enthusiasm) went on this pilgrimage.

"In this manner an ancient agriculturist *(Pándiyánákira vellázhan)* of the north-country having set out on this *Ramesvara* pilgrimage came (thither). While coming, having seen this southern *Danda-aranya*-plain (wilderness of *Dandaca*) and this (*Pandya?*) wilderness plain, with the goodness of soil of this land, and the great rivers in this wilderness, and reflecting on the (degree of) fertility of soil in his own kingdom in the north, and the (degree of) fertility in the soil of this untilled land, perceiving further the goodness of this (latter) he arrived, and having bathed at this *Chethu* (isthmus, or bridge) of *Ramésuram*, completing his pilgrimage, and having paid personal homage to *Paradvá-sa-rishi*, he proceeded, and arrived at his town in the north."

It is then added that he assembled his whole family (or tribe of dependents) and proceeding with them colonized the extreme south, *again establishing Ramésuram,* and then going westward, cleared the woody-ground on the banks of the *Vaigai* river, built a town with its complement of fanes or shrines, and appointed the rule of cultivation, by which a small revenue at first would be gradually increased from year to year, by receiving a larger proportion of the produce. There is, however, throughout no mention of this person's proper name, nor any specification of the particular country or "kingdom" whence he came.

Now, I should not suppose that this statement would be considered sufficient to set aside such authorities as the *Hari vansa* and *Agni Purana,* with that of other manuscripts given by me in the translations more than once referred to. The account is simply that of a native Tanjore Christian, ignorant of just rules of criticism, and exceeding the bounds prescribed to him by his religion, which would allow him to despise the superstitions of the heathen, but not haughtily to reject the evidence of documents, claiming to be historical, and to substitute his own possibly veracious legend in their place. With the assistance of the *Chola-desa purvika Cheritra* written by the same individual, the broadest proof can at any needed time be adduced of his unfitness, through religious prejudice, to discharge the office of an impartial historian, even though it should be of faults, follies, or errors. Of course, I do not think his Christianity concerned in the matter; for the same want of candour or rectitude that I should blame in a Porphyry or a Voltaire, I should blame in a native Christian, if I saw it taking a converse direction in its bearing on native annals; be their subject what it may. Unhappily, as I think, Professor Wilson reposed too much confidence in the dashing, free-thinking, statements of this native, as is very visible in the catalogue. A somewhat fictitious importance has devolved on the passage of the native author's book which has been in question; but remembering that Professor Wilson, while justly insisting that he found in the translation ostensibly by Mr. Clarke, traces of this interpretation, has given up any thing beyond that, I will close this discussion by stating my own full concurrence in his admission, in these words---"that Pandya of Oude," or "a northern Pandion;" had any personal part in the settlement of the country is equally improbable.* Nevertheless the fact would have been received as undoubted, on the authority of Professor Wilson, had no counter-evidence appeared.

The next point which I consider it of any importance to notice, is the identifying *Kurk'hi* with the Kolkhi of the Periplus; and both, following D'Anville, with *Kilkhar* or *Kilakarai,* a sea-port on the Coro-

* Supplementary Note to Hist. Sketch, para. 4.

mandel coast. In the first part of the identification I am disposed to concur; in the latter part of it to differ. Notwithstanding the many cautions given by so many scholars on the subject of etymological deductions, they are not abandoned; yet they are not safe, without a knowledge of the vernacular language to which they refer. I have not No. 5. J. R. A. S. to refer to; and therefore can here only observe that *kilkarai*, simply means the east-shore; and is written கீழக்கரை, whereas கொற்கை *Gorrkai*, the native name of Madura in early times, has no other meaning, that I am aware of, and is radically a different word. In such a point however both D'Anville and Wilson might easily mistake by etymology. I should hesitate to hint even at any analogy between the name of old of Madura, and the distant Goorkhas of Nipal, had I not recently traced a resemblance between the Tamil alphabet and that of Thibet, as exhibited in some specimens from M. Csoma de Coros, given in the Bengal Asiatic Journal; and there may be added to this resemblance the fact that *Agastya* the acknowledged "father of the Tamil language" (that is, as I presume of its *written* language), was, according to tradition, a native of Thibet. Of course this resemblance must not be made the basis of any premature conclusion.

Any supposed discrepancy between the *Pandya Rajakal*, and the *Tiruvilliyádal*, on the spelling of the word *Chédi* in the former, with the *Setu-raya* of the latter may be easily obviated, without any necessity of adverting to central Hindustan. The Tamil language has properly no sibilant *s*—its own character corresponds with the first palatal letter in Sanscrit that is *ch*, and it is rather a modern erroneous refinement which tends to give the sound of *s*, rather than *ch*, to such words as சேது, which I have myself represented it is true by *Séthu;* but which would be correctly given by *Chethu*. Add that the து, which corresponds with the first Sanscrit dental letter *ta*, is by various persons written in English characters either *t* or *d*, the *u* final is very short, and if a person were to write by ear, he might write *Chedi* just as probably as *Séthu:* if a Telugu man, he would, I think certainly do so. Hence, the two authorities in the original characters I presume to be perfectly harmonious; and the difficulties to be experienced by a compiler from crude translations may receive some passing elucidation. In my copy of the *Pandya-rajakal*, accurately taken from one so labelled in the Mackenzie collection, I do not find the particular fact referred to recorded; but I am apprehensive that this is not the document referred to by the Professor; a supposition which I prefer to blaming the translation made use of by him.

The daily aerial visit of the Chola prince to the shrine of Sundarésvara, is not recorded in my copy of the Madura Purana. It has in it

marvels enough; but the aspect which it gives to the *one* visit of the Chola-chief, is rather construable into a well wrought piece of contrivance on the part of the Brahmans, and the *nodus* thought worthy of the god to untie, is the restoration of the seal on the temple-gate, which had been broken during the night. Copies may vary; and at best perhaps the tale is merely a gibe at "the shameless sect" of the hated *Samunar*.

I hesitate as to allowing no existing work to *Narkiren* the famous chief of the Madura College, at least on the reason alleged. The MS. on palm-leaves (Des. Cat. vol. 1, No. xxiii) entitled *Alakeswara-katha*, may at once be set aside on the ground assigned by Mr. Kindersley, but among the MSS. on paper there is one in a book,* No. 7, sec. 2, entitled *Alakesa raja Cadha*, apparently the one intended by Mr. K. to which however his remark in reference to difficulty will not apply, for in portions of it, there are verses in it dark as the Sphinx's riddle, and expressly so intended to be. Popular tradition ascribes this work to Narkiren, as a *jeu d'esprit*; but my own reason for doubting his authorship arises from the part which the poetess *Avvaiyar*, is made to take in it. A just deduction will I think place *Avvaiyar* much later than *Narkiren*; and a haughty *Brahman* who *(sic dicitur)* would not concede the palm to *Siva* himself, was not the person to do honour to a *Paria*-poetess.

With regard to *Agastya*, I believe, that many of the works imputed to him are not genuine; but I think so much is due to uniform tradition as to concede that an individual so named, first gave to the Tamil people a written alphabet, and some outlines of grammar, and this too at a very early period; though his labours were ultimately eclipsed and set aside, as regards grammar, by the *Tolcapiam* and *Nannul*.

The opinion given by Professor Wilson in the catalogue as to the existence of *Bauddhas* and *Jainas* at Madura, re-appears in the sketch, though very considerably modified. The translation by the Honorable G. Turnour, Esq. of the *Mahawanso* a *Pali* work, having since confirmed the conjectures thrown out by me in the two vols. O. H. MSS. as to the original identity of those two sects, I should not advert to the subject, were it not to state that I do not see, how for a moment the work of *Tiruvalluvar*, could even in conjecture be thought to have subserved the introduction of the *Jain* or *Bauddha* faith into Madura. *Hindús* look upon his book as quite orthodox. I may note

* I have not succeeded in tracing out this book in the Des. Cat: the document Sec. 2 Art. xxiii. p. xlii. App. vol. 2, seems to be only a duplicate copy of the other tale, and the contents do not accord with those of the five sections in book No. 7.

During the interval between writing this note, and correcting the press, I have found the tale mentioned in the Catalogue, under the title of Tamul Perumal Cheritra—*By* Seyallar.

that the word *Kadal*, if not a misprint, must be traceable to very careless translation. That word in Tamil means *the sea* (being synonimous with *Samudra* in Sanscrit) whereas *Cural* is the title of the poem, denoting a particular species of Tamil versification.

I shall add no further observation as to the more modern portion of the sketch except it be to remark that, throughout in the subordinate running notice of the *Setu pati* and the *Maravas*, there seems to me to be some confusion or repetition; some anachronisms and errors: for example, the *Setu pati*, was at no time independent of the Nayak-dynasty of Madura; but was merely the chief feudatory. So much however at different times has been written by me regarding that principality that I need not add more.

To me the most striking portion of the whole sketch, is a note attached to para. 7. The account in that *para.* of *Malaya Dhwaja* might have been enlarged; but at present I have to do with the note. It is therein said that "the traditions of the south make him a more important character, and consider him as the father of Chitraganda the wife of Arjuna." The visit of Arjuna to Madura and his marriage there with the king's daughter is very fully recorded in my copy of the Tamil *Bàratham*, an abstract or prose-version of the *Mahabharata;* but whether to be borne out, or not, by the collated Sanscrit work, I cannot tell. However, there is not the slightest mention made of *Malaya Dhwaja*. The only question with me is, how did the Professor come at "the traditions of the South." Not by personal intercourse it need not be said, neither by manuscript authority, for that is not tradition, nor yet from Col. Mackenzie's assistants, for such of them as were at Calcutta were Telugu Brahmans, who never went very far south of Madras, and besides Professor Wilson has somewhat indignantly rejected the idea of trusting to verbal information from them. I know not where else to look for the traditions except in the first vol. of Or. H. MSS. where the conjecture is thrown out, and occasionally again and again referred to, as merely my own conjecture, arising from a notion produced, as I was going on with my work, that possibly the entire origin of the whole superstitious fable, in which a marriage is so conspicuous, might turn on the asserted visit of Arjuna to Madura. I certainly never heard it from any one, nor copied it from any book; and in the face of considerable difficulties I still think it plausible if not probable. Had not the Professor carefully barred out the idea of his having made any use of my assistance in his sketch, I should have thought that he had done so, my first volume of translations having reached England at the close of 1835. A doubt arose on the subject in various places, while reading that sketch; but especially in reference to this particular note. However, I may mistake; and will not be positive.

There are some matters of less moment in different parts of the sketch, which might be commented on ; but I forbear.

It is now due to the learned and indefatigable Professor to state that he has made a better sketch of the History of Madura of the olden time, than I should antecedently have thought to be practicable from his acknowledged materials. The general accuracy—in so far as native documents can be admitted to be authentic—predominates over the occasionally doubtful or erroneous portions ; and that there are a few errors in it tends not to reflect by any means on the Professor's labours, but to elucidate a point of some public moment which I announced my intention to develope. This is, that if there be any person in Europe who could educe, and set forth in order, the contents of the Mackenzie MSS. , Professor Wilson is that man. I do not think any one could vie with him ; yet since even his account of the plainest and best authenticated portion of Peninsular history is defective, owing to the materials wrought upon, then no person in Europe I conceive is qualified properly to give an adequate or fair representation of the contents of that collection. The full investigation of them in this country is perhaps the more important from the possibility of being made answerable for documents never contained therein. I have seen a production and a very clever one too, which, lauded by the *Atlas* as just the thing they would wish to see generally done in reference to the Mackenzie MSS., and transferred to the pages of the Madras Journal of Literature and Science, is yet, I will venture to say, essentially non-oriental, though quite western, in character ; and, with possibly some foundation in the Colonel's own Survey-papers in the Mackenzie collection, is yet for the greater part possibly the result of the able writer's own ingenuity and personal observation.

Should Professor Wilson follow out his expressed purpose of giving accounts, in the Journal of the Royal Asiatic Society, of the other Peninsular dynasties, before any thing of the kind may proceed from myself, there is no one else who would offer them a more cordial welcome, or read them with greater interest and pleasure. I should rejoice to receive hints or corrections from such a source. However, I retain my impression, long since announced, that the field is not ripe for the harvest of the general historian ; or for discussion and condensation. All original authorities, worth any thing at all, should in my opinion be printed in parallel pages, with faithful and literal translations. Annotations may be added ; but inferences or conclusions, in a general or final way, ought not to be drawn until the whole evidence is fairly and fully given. Then the judge and recorder may come, sum up, abstract, decide, and ordain ; but, as it seems to me, not at an earlier period.

ADDENDUM.

Subsequently to my having sent in to the Editor of this Journal the foregoing observations, I incidentally met with the number for January last of the *Asiatic Journal,* on the library table of the Madras Literary Society. It contains a brief critique on the second volume of Oriental Historical Manuscripts, little more than an echo of some statements of Professor Wilson, and in a tone of so much subserviency to him, that I might be at liberty to pass it by without remark, especially as I had written the foregoing, without knowing anything of an article seemingly composed with so studied an effort towards the depreciation of my imperfect production, which I should be the last to consider free from faults. But, since the writer of that critique expressly indicates an opinion that I had borrowed from the pages of the *Asiatic Journal,* it may perhaps be as well simply to deny the implication. Adverting to the Carnataca Chronicle the writer says—"the whole of the 'History' was given in this Journal ten years back, and we cannot help remarking that the co-incidence of expression in the two translations is so striking, that we are almost justified in asserting that Mr. Taylor must have had this version before him at the time when he executed his own. If not, we can only say it is one of the most miraculous instances of correspondence between independent translations of oriental works ever known or heard of."

I regret that I have not the volume of the *Asiatic Journal* referred to by the writer at hand, to compare with my translation, but, however miraculous the correspondence alleged to exist between the two productions may have appeared to him to be, one thing is certain, which is, that I had not the slightest knowledge whatsoever of the existence of such a paper until I met with this statement of alleged co-incidence, and implied plagiary. I think, however, that I am able to solve the enigma without having recourse to a miracle. In the preceding observations, towards the beginning, I have mentioned my having a rough paraphrastic translation by Mr. Wheatley of the Carnataca Chronicle, which I had intended to make use of. My intention, had it been fully carried out, was to have given him the merit of the translation, and to have added a brief sketch of his life and labors. In pursuance of that intention, I compared the translation and original; and, as both were to appear on parallel pages, I found Mr. Wheatley's mode of translation would not do. I then attempted to render his translation more literal by various alterations; a mode of proceeding which proved to be more tedious, and less satisfactory, than simple translation, to which I then resorted on my own principles. A page or two, however, of his translation, with my alterations, I sent to the press, and the first section of the Carnataca dynasty, possibly a portion of the second

section, gives the result of my attempt to act upon my first plan, which, to my regret, I was compelled to lay aside, and with it my proposed notice of Mr. Wheatley himself. Those who know the relationship in which I am placed towards that late excellent man, will readily comprehend why I wished to pay him a public token of respect, as well as understand my regret on finding that it could not be handsomely done. Now it is evident that the translation, which I then supposed had not passed out of his hands,* must have been copied out fair, and supplied to Colonel Mackenzie, seeing that the translation by Mr. Wheatley is enumerated by Professor Wilson as among his authorities. It follows also that very probably this same translation was printed in the pages of the *Asiatic Journal.* If such a supposition be true, it will also follow that the alleged miraculous correspondence, could not be so perfectly complete as is implied, nor could any co-incidence extend over the second section, except as to the facts recorded, which, in both translations, would be the same. I am not therefore uncandid when I infer, that the critic's comparison did not extend over the second section at the utmost; and that he was not very particular in his inspection is manifest from his singular caricature and omissions, as to the appendix to the second volume, which he professes nevertheless to define; as well as from the circumstance of quoting a passage as if from the Tamil, which in reality was a translation from Telugu. Indeed it may have been an object with him to deny to me any thing beyond " a familiarity with the Tamil language;" and, if so, to effect it he has taken a liberty with the passage, in quoting it, utterly unpardonable. The translation from the Telugu is (vol. 2 p. 205)—" In those days the Padshah (customarily) sent to all countries, &c." The critic's professed quotation says—" The Tamil author states that the Padshah (Mogul) in those days was accustomed to send, &c." Begging his pardon, the Padshah referred to was not the Mogul, and the words " the Tamil author" are quite gratuitous, and unwarrantable. Had he looked at the top of p. 190, he would have seen the translation expressly stated to be from the Telugu language. Further, when a critic says, " one of the anecdotes, &c. may be worth citing," it would of course be supposed that what follows in smaller type is a quotation: it is however no such thing. On reading it over at the Literary Society's rooms the thought arose—" are these my words "?—and comparison has proved them not to be so, but the critic's own abstract of what I wrote, and in abstracting he has made me amenable for language which I did not use, and which is anything but a translation of the original authority. To expose such glaring disingenuousness I should consider quite sufficient for the criticism. I must, however, regret the critic's attempt to make it appear as if I sought a comparison with Professor Wilson, who in " Sanscrit litera-

* See Oriental Historical MSS. Vol, I, Preface p, xvii.

ture," in "general learning," and "critical knowledge," I readily recognize to be my superior: if I claim any equality, it is in the moral attributes of truth and simplicity. When, moreover, in pursuance of his comparison by contrast, the critic says—"the one is an historian the other a translator"—I readily acknowledge this also; and, after so many indications as I had given, in the two volumes of Translations, of my opinion that in Hindu history we want literal Translations as the basis of future deductions, I wonder that he should have thought that I assumed the office myself of historian. Perhaps Professor Wilson has not assumed so much: if he has done so, the future historian, really such, will probably cut down his sketch to smaller dimensions.

I have, however, now done with the critic; and avail myself of the occasion offered me to translate, and thereby quote, a few pertinent remarks of Mons. M. A. Langlois in the Introduction to his French Translation of the *Hari Vansa,* published in 1834, by the Royal Asiatic Society. Mons. Langlois says—"It has seemed to me that the opinions of those who had occupied themselves with the ancient history of India, had always wanted a basis, and that, in being called to be their judges without having under our eyes the vouchers of the process, which they alone had consulted, we were obliged to yield an implicit credence to their assertions, often shaken by the contradictions themselves of their various systems. I have wished that it were possible to furnish criticism with the proofs of which it has need, so as to give to India that history, the existence of which, up to the present time, is doubted. I have not been able to believe that this people, which have existed so long, and occupy so vast a surface on the globe, who hold so distinguished a place alike in past and present times, could continue disinherited of their ancient annals: I have thought it to be needful to go and seek for these in India's own books, where they will be found often mingled with fables of every kind; and that, in translating these writings, it would be well to deliver over to criticism, frankly, and without any attachment to a system, the materials which ought to serve in this work of re-construction."*

These sentiments are the same, in other words, as those, more than once, asserted in my two volumes of translations; and since repeatedly maintained by me, both in the columns of this Journal, and elsewhere; without knowledge of M. Langlois's views, which have only very recently come to my acquaintance. Perhaps with a pardonable complacency he places himself at the head of those who shall follow after him in this plan of proceeding. I conceive, however, that the credit of the plan rests with the Royal Asiatic Society. They, as far as I know, first laid down the principle as to literal translations. Their idea struck me as just, and I followed in my imperfect measure. M.

* Introduction—*para* 2.

Langlois has done so ; only omitting the needful point of printing the text in parallel pages. I may add that the Honorable G. Turnour, whom I ought to place perhaps first, has followed the same system in his translation of the *Mahawanso*, and, allowing for others unknown to me, we have two scholars, and myself—a humble third labourer—acting on one plan, as nearly as possibly at one time, and in three very distant places on the globe. And we, with those that may join with us, shall ultimately prevail. When I most respectfully add the Committee of Papers of the Bengal Asiatic Society, and, as I believe, I may do, the Committee of Papers of the Madras Literary Society, to those who approve of this plan of proceeding, I do not mean to place them last and least, but to shew that there is as strong a re-inforcement as perhaps can be offered or expected. Premature historians will not stand the test of the results ; and sycophant critics will not impede them.

As regards the difficulties of translation in Europe, concerning which I have more than once offered an opinion, the experience of M. Langlois may also be adduced, though those difficulties are less as regards Sanscrit possibly than any other language of India. M. Langlois says,—" I am myself first to feel all the imperfection of my work, which has been performed from a text deduced from three manuscripts, not very correct ; of which two, the one Bengali, and the other Devanagari, belong to the Royal Library at Paris, and the third given by Mr. Tod to the Asiatic Society of London, was obligingly communicated to me. But no one of them had a commentary ; of which I but too often found the need. Phrases singularly concise, allusions incomprehensible, words unknown, have often stopped me ; and I ought not to flatter myself that I have always avoided the danger of shipwreck which they presented to me. I may have made mistakes ; but I venture to hope that the learned, who alone will perceive them, will be most ready to pardon me, appreciating, with a kindly feeling, all the difficulties which I had to overcome."* As an example of those difficulties, M. Langlois meets with the word, *Vasous (Vasus)*, and in a note he asks " what are the " *Vasus* ? I avow that in this point, I can only form conjectures." I do not quote the example invidiously, far from it : for M. Langlois has done his difficult work, generally speaking, well ; but such are the difficulties to which scholars in Europe are liable. The text along with the translation, in parallel columns, would have, been desirable : and when India's own native works, fabulous, mythological, allegorical, poetical, and the like—always denying the epithet historical—shall have been, on that plan, duly and fully developed, either I greatly err, or India will cease to want a history.

* Introduction p. xv.

XIII.—*Horary Meteorological Observations made at the Equinoxes and Solstices, agreeably with the suggestion of Sir* JOHN HERSCHEL.

1*st.*—*At the Madras Observatory.*—By T. G. TAYLOR, Esq. *H. E. I. C. Astronomer.*

1837	Time.	Barometer.	Ther.	Direction of wind.	Strength of wind.	Weather.
June		inches	°			
21	6 A. M.	29.854	86.3	——	Calm	Cloudy—drizzling rain.
	7 ,,	.880	81.6	——	do	do do
	8 ,,	.900	80.1	N. W.	Very gentle	do do thunder.
	9 ,,	.920	79.7	do	do	do do do
	10 ,,	.920	79.0	do	do	Cloudy.
	11 ,,	.912	82.6	W.	do	do
	12 ,,	.900	84.0	W.	do	do
	1 P. M.	.883	83.8	N. W.	do	do
	2 ,,	.860	85.0	do	do	do
	3 ,,	.880	85.2	do	do	do
	4 ,,	.845	85.0	S.	do	do
	5 ,,	.845	85.0	E. S. E.	do	do
	6 ,,	.852	84.8	do	do	do
	7 ,,	.872	84.2	—	Calm	do lightning to the W.
	8 ,,	.900	84.2	S. E.	Very gentle	Clear do
	9 ,,	.902	84.3	do	do	do do
	10 ,,	.920	83.5	do	do	Haze do
	11 ,,	.918	82.8	do	do	Cloudy do
	12 ,,	.892	82.4	do	do	do do
22	1 A. M.	.854	82.0	S.	do	Haze.
	2 ,,	.850	81.0	S. E.	Calm	Clear.
	3 ,,	.864	80.5	—	do	Flying clouds.
	4 ,,	.866	80.4	—	do	do do
	5 ,,	.876	81.8	S. W.	Very gentle	Haze.
	6 ,,	.886	81.7	do	do	Clear.
	7 ,,	.904	81.9	do	do	do
	8 ,,	.922	83.2	do	do	do
	9 ,,	.930	84.4	S. S. W.	do	do
	10 ,,	.932	86.3	W. N. W.	do	do
	11 ,,	.930	88.2	W.	do	do
	12 ,,	.922	88.2	S. E.	Gentle breeze	Flying clouds.
	1 P. M.	.910	88.4	S.	Moderate do	do do
	2 ,,	.900	87.8	S. E.	Strong do	Clear.
	3 ,,	.850	87.5	do	do	do
	4 ,,	.846	87.0	do	do	do
	5 ,,	.850	86.0	do	do	do
	6 ,,	.848	86.0	S. S. E.	do	do

2d.—At Hoonsoor, in Mysore.—By WM. GILCHRIST, *Esq. of the Madras Medical Establishment.*

Day.	Hour.	Dry thermometer Fah.	Wet thermometer.	Barometer.	WINDS.	CLOUDS, &c.	REMARKS.
June 21	6 A.M.	68.25	66.75	27.416—	S. W. merely perceptible.	Overcast.	Rain yesterday afternoon, thunder and lightning this morning—ground wet—feels raw and damp.
	7	68.9	67.5	.422—	do rather stronger.	Overcast with low nimbi moving N. E.	
	8	72.25	69.5	.448—	do light breeze.	Overcast—N. E. quarter dense cum-strati—S. W. quarter clearer.	
	9	74.5	70.75	.464—	do do do	Do. some low cumuli in various parts of the hemisphere.	
	10	75.5	70.75	.482—	do do do rather stronger than at 9.	do. low dense cumulo-strati, and nimbi in N. and in E. quarters, moving N. E.	
	11	77.9	71.25	.484—	do as at 10.	Low, dense cumuli and cum-strati, edges ragged, over hemisphere.	
	12	79	71	.464—	do occasional airs.	Overcast—cumuli over hemisphere, but smaller and less dark	
	1 P.M.	80.5	71.25	. 45—	do light breeze......	Large, dense dark cumuli and cum-strati over hemisphere.	Sun obscured—no shadow.
	2	76.5	70 5	.434—	W. by N. breeze.	Nimbi.	Do.do. rain commenced quarter to 2--has been raining in the vicinity last hour.
	3	75.5	71	.414—	W. by S. do	Overcast—dense cumuli and cum-strati.	Rains N. E. and E. quarters.
	4	77	70	.412—	S. W. do	do cum-strati around horizon.	
	5	74.5	68	.412—	S. W. do	do do do do do	
	6	72	67	.410—	do. do	do do do do do	
	7	71.75	67	.442—	do light breeze	do strati near horizon.	
	8	71.1	67.25	.434—	do do do.........	do a belt of cloud extending from S. W. to N. E.	Lightning to the eastward.
	9	70.5	67.25	.444—	do do do.........	Overcast—stars faintly seen.	
	10	70.5	67.75	.464—	do do do.........	do do do	
	11	70	67	.464—	do airs	do banks of whitish cloud in various quarters.	
	12	69.25	67.25	. 45—	do breeze.............	do do do do do	
22	1 A.M.	70	67.5	.452—	do do	do low ragged edged cumuli moving N. E.	
	2	70	67.5	.420—	do light breeze	Nimbi, scud, moving N. E.	Drizzle.
	3	70	67.25	.434—	do do do.........	do do do do	do.
	4	69.5	67.25	.420—	do do do........	do do do do	do.
	5	69	67	.416—	do breeze	do do do do	do.

Day.	Hour.	Dry thermometer Fah.	Wet thermometer.	Barometer.	Winds.	Clouds, &c.	Remarks.
22	6	69	67	.434—	S.W. light breeze……	Overcast.	
	7	71.5	69	.436—	do airs	do. low, ragged edged cumuli moving N. E. In northern quarter an extensive bank of nimbi	
	8	72.5	69.5	.456—	do light breeze ……	Overcast, low, ragged edged cumuli moving N. E.	
	9	75.25	69.25	.480—	do do do………	do dense cumuli and cum-strati.	
	10	76	69.2	. 49—	do do do………	do do do do	
	11	77.5	70	. 49—	do breeze.	Overcast, except in S. E. quarter. Dense cum-strati near horizon. Nimbi S. W. quarter.	
	12	78.6	69.9	.486—	do do	All round horizon cumuli and cum-strati—zenith overcast—clear on part midway between zenith and horizon.	
	1 P.M.	80.9	70.25	.482—	do rather strong breeze.	In upper regions thin ragged cirri and strati, both stationary, lower regions cumuli, moving N. E. ……	Between the upper and lower stratum of clouds there appears to be electrical action—the latter frequently become ragged at edges and send off portions—subsequently become rounded.
	2	81.1	70.1	.470—	do do do do …	Overcast with dense cumuli and cum-strati. ……	Shadow on horizontal plane 3.214 inches, perpendicular being 6 inches long.
	3	79.5	70·5	.460—	do do do do …	do large dense cumuli and nimbi moving north-east, upper stratum of cloud stationary. … …	Rain to the northward.
	4	75	70	.456—	do strong breeze……	Nimbi. ……	Rain last half hour.
	5	73	69	.444—	do do ………	Nearly overcast, low clouds moving rapidly N. E.	
	6	72.4	69	.452—	do strong breeze …	Small nearly detached cumuli over hemisphere in upper regions—low thin scud moving rapidly N. E.	

Total quantity of rain during observations 0.191 inch, determined by weighing. The thermometers used were placed under a thatched verandah uninfluenced by radiation or reflection. The barometer at a window immediately adjoining having a northern aspect—the thermometers are correct—the barometer is .042 too high—the heights given are as read off without any correction.

The shadow was determined by an apparatus consisting of a rod of iron pointed at top, and rising perpendicularly to the height of six inches, exactly above the plane of a piece of wood $2\frac{1}{2}$ feet long by 2 inches broad. At each corner of the wood a screw is placed by way of foot; by which is effected the adjustment of the upper surface of the wood to the true horizontal as indicated by two levels attached to it at right angles to each other. In order to see distinctly the shadow, a piece of white paper was pasted on the upper surface of the wood, with every care to preserve a level surface. The termination of the shadow was pricked off at the respective time of observation, and the length between the mark and the semi-diameter of the wire was measured with the detached scale of a barometer vernier, which read off to 1-500th of an inch.

Hoonsoor is W. 13° south of Seringapatam, distant $28\frac{1}{2}$ miles, and is W. 5° N. of Mysore, distant 26 miles.

3d.—*At the Trevandrum Observatory.*—*By* J. Caldecott, Esq.

Date.	Hour.	Bar. corrected for tempr. 32.	Thermr.	Depress. of W. B. therm.	Dew point.	Direction of wind.	Velocity of do	Clouds, aspect of the sky and remarks.	Solar radtn.*
			°	°	°				
June 21	6 A.M.	29.845	75.0	1.8	72.39	W N W	1.	Cum. and fl. cl. threatening from W.	
	7	.855	75.3	1.7	72.85	N by W	3.	Overcast.	—
	8	.873	76.0	1.0	74.57	N W	1.	do.	0.5
	9	.878	77.2	1.7	74.82	W by N	1.	do.	0.75
	10	.893	77.9	4.2	71.9	N W by W ½ W	2.	Heavy cum. and fl. cl. threatening.	—
	11	.887	79.3	2.1	76.4	N W by W	1.	do. do. do.	1.9
	Noon	.878	81.5	3.8	76.25	do	1.	do. whole sky obscured threatening —squall of wind and rain from W. at 12*h*. 10*m*.	5.75 —
	1 P.M.	.881	79.2	2.8	75.31	N W	1.	Rather clear—flying clouds.	5.4
	2	.853	80.8	4.5	74.5	do	0.5	Overcast with heavy cum. rain at 2*h*. 30*m*—light wind N. W.	.95
	3	.839	77.0	3.0	72.73	W N W	1.	Overcast—cum.	Observations prevented by clouds and rain.
	4	.835	77.5	2.5	74.	N W	1.	do. do.	
	5	.838	77.2	3.0	73.	N W	1.	do. do. raining.	
	6	.843	76.4	2.6	72.65	N W by W	1.	do. do.	
	7	.864	75.7	2.2	72.54	do	1.	do. flying clouds about zenith.	
	8	.884	75.7	1.7	73.26	do	1.	do. do. do.	
	9	.899	75.5	1.5	73.37	do	1.	do. do. raining.	
	10	.909	75.4	1.4	73.4	do	1.	do. do. do.	
	11	.905	75.0	1.0	73.55	do	1.	do. do. do.	
	Midn	.895	75.0	1.0	73.55	do	1.	do. do. do.	
22	1 A.M.	.873	75.1	1.4	73.0	N by W	1.	Overcast.	
	2	.848	74.2	0.8	73.0	N	3.	Light cum. in zen. heavy at the hor.	
	3	.842	72.6	0.0	72.6	do	4.	do. pleasant breeze.	
	4	.849	72.6	0.1	72.5	do	4.	do. do.	
	5	.853	73.5	0.5	72.77	do	3.	Overcast, do. drizzling.	
	6	.870	74.0	1.4	72.0	W S W	4.	Heavily overcast and raining.	
	7	.885	73.5	1.0	72.0	W S W ½ W	2.	do. do.	
	8	.906	73.7	0.7	72.69	do	2.	do. do.	
	9	.920	74.5	0.9	73.22	do	2.	do. do.	
	10	.943	75·7	1.2	74.0	W S W ¼ W	2.	Fl.cl. in zen—cum. about the horizon.	
	11	.942	76.0	1.5	73.9	N W by W	1.	do. do. drizzling.	
	Noon	.931	75.0	1.5	72.84	W N W	2.	do. do. raining.	
	1 P.M.	.921	74.0	1.3	72.1	N W by W	2.	do. do. do.	
	2	.903	75.7	1.3	73.85	N W	1.	do. rather clearer.	1.95
	3	.892	76.5	2.2	73.37	do	1.	Overcast.	0.5
	4	.891	77.2	2.7	73.3	N W by W	2.	do.	0.5
	5	.893	76.4	2.9	72.22	N W	3.	do. raining.	—
	6	.895	75.7	1.7	73.26	do	1.	do. drizzling.	—

*Note.—These two days were unusually obscured—the actinometer on the four preceding days indicated *at noon*—7,75—12,6—12,25 and 2,25 respectively.

June 21st.—Fall of rain from	6 A. M. to 6 P. M.	....	.201
,, 22d.—do.	6 P. M. to 6 A. M.	....	.8835
do.	6 A. M. to 6 P. M.	....	.5893
	Total in the 36 hours	......	1.6738 inches.

No thunder nor lightning.

EXPLANATION.

The barometer is the same as was used in the Trevandrum Observations on the 21st and 22d March; in the account of those observations it is mentioned that it appeared to be an instrument worthy of confidence, from a comparison of it made with a fine syphon barometer by Robinson :—it may be as well however to explain that this opinion was formed from the regularity of their differences only; that

comparison not establishing the zero-point of Wrench's instrument—the other by Robinson not having been compared with any standard. The latter, however, being one of the syphon kind, may be considered free from most sources of error to which the other is liable, except those arising from the sp. gr. of the mercury, and any error in graduation, and those are not likely to exist in an instrument carefully made by so first-rate an artist. This comparison showed a difference of .007; Wrench's being in excess of the other by that quantity, before any allowance was made for capillarity—with the addition of .075 on this account, the difference was .082. This difference was not attended to in the March observations, nor in these; the observations being left as they are, for a future certain decision of the true zero-point. The correction for temperature is made as before and the same constant .075 is added for capillarity.

The thermometer is the same standard one by Troughton as was used in March, the moistened thermometer is also by the same maker, but indicating 1° higher previous to applying water to the bulb; this has been allowed for in the column of depressions. The dew points are calculated from Professor Apjohn's formula $f'' = f' - \frac{d}{87} \times \frac{p}{30}$ disregarding the correction $\left(\frac{p}{30}\right)$ for pressure—which in this case is insensible.

The direction of the wind is shewn by an anemoscope, and the numbers in the eighth column express by estimation its velocity in miles per hour.

The solar radiation—or the direct heating power of the sun's rays—is measured by a Herschel's actinometer (an account of which is published in the third report of the British Association) and, as affording an interesting comparison of the intensity of the solar rays at the four opposite seasons of the year in this climate, the observations with this instrument will be continued.

The time is the true mean time of the Trevandrum Observatory, in latitude 8° 30′ 35″ north, and longitude 5*h.* 7′ 59″ east.

The elevation of the situation in which the March observations were made was by mistake in copying, stated to be about 50 feet instead of about 150 feet above the sea—the true elevation at which they were made has since been found to be 138¼ feet. The instruments are now placed in a building erected expressly for the purpose, in which the radiation and reflection of heat, and every other disturbing cause, are carefully guarded against. It was in this building that the present observations were made, and the cistern of the barometer is ascertained by actual levelling to be 177¾ feet above the level of the sea (distant in a direct line about two miles). The heights of the mercurial column given in the register are therefore those due to this elevation, corrected for temperature and the bore of the tube, but liable to a future correction (of some small amount) on account of the zero-point.

XIV.—Notices of Books.

Transactions of the Agricultural and Horticultural Society of India. Vol. 3d.—Printed at the Serampore Press, 1837—pp. 320, 8vo.

(Second Notice).

At the conclusion of our last notice of this work, we promised to examine the commercial section in this number, and consider, somewhat in detail, the numerous papers connected with the cultivation of Cotton and Tobacco, as objects, in a commercial point of view, of primary importance.

The papers in the volume, more or less exclusively devoted to the consideration of these two plants, amount in all to twenty-one. Of these twelve make no reference to tobacco; five none to cotton, and four refer to both. We shall first consider

Cotton.—The first paper is a letter transmitting a bag of "Vine cotton seeds," said to be a very superior description of cotton, but of rather too long a staple! which from tending to weaken the fibre, lessens in some degree its value. The seeds were sent to Gowhatty in Assam, and to Mirzapore. It is to be hoped, should this first supply succeed, that we shall soon have an opportunity of trying it in Madras from seeds of Indian produce.

The next two papers on cotton, are letters from Colonels Colvin and Skinner, communicating the results of experiments for the introduction into the upper provinces of Upland Georgia cotton; the exertions of both of whom seemed to promise a very favourable result, but the matter was still doubtful at the period of writing. It seems strange on this side of India, in the inland districts of which the Bourbon cotton plant almost every where thrives, that it has not been more generally introduced in the upper provinces of Bengal. Here it is found a hardier and more productive variety than the Upland Georgian, and the produce higher priced in the English market by some pence, than the Georgian raised on the same lands, or in varying soils in the same tract of country. The fourth notice is a letter intimating the dispatch of a case of Peruvian cotton seed from Liverpool. The cotton is said to be very fine, referable to the long staple class of cottons, and worth about one shilling the pound at the time of dispatch; none of that kind, we believe, has yet reached Madras.

At Allahabad trials of Sea Island had failed, apparently from the seed being bad, but, in the neighbourhood, some Pernambuco seed had been sown and was most thriving. Transplanting had been tried to

some extent, and most successfully. That species, the *Gossypium acuminatum* of Roxburgh, bears transplanting well—some which we have in our garden has been twice transplanted without the slightest injury. We consider that a very desirable species to introduce extensively into cultivation, as being a large and vigorous plant, and a free grower, which may be subjected to almost any treatment, except perhaps too rich and moist a soil. In its culture, free pruning seems quite indispensable to the production of large crops, and we believe it may be annually cut down to the roots, though the better plan appears to be, merely to shorten all the larger lateral branches, as well as the leading stem, during the hot season, after the crop has been gathered, which will always ensure an abundant supply of fruit bearing branches without over crowding the ground.

The next paper on cotton is by Mr. Bell, but, being of a controversial nature, we shall for the present pass it, and return to the subject when we have glanced at the remaining papers on the cultivation of cotton.

Part of the Peruvian cotton seed, before mentioned, was sent to Mr. McLeod of Seonee, along with some Egyptian; both vegetated to a greater or less extent, but, owing to the very wet unfavourable season, a failure was anticipated in both cases, but, as both were expected to produce some seed, it was hoped future trials would prove more successful.

This paper is immediately followed by an interesting one on the culture of cotton in Bundlekund. It consists of a series of questions by Mr. Hodgkinson, and replies by Mr. Bruce. From it we learn there are five kinds of soil, the best of which is the *maura*, or black marl, the rent of which varies from one rupee thirteen annas, to two rupees eight annas, per beegah of 18,225 square feet—that some of the best *maura* lands will produce as high as nine maunds of seed cotton per beegah, one-third of which is cotton and two-thirds seed, but the average for that kind of land is only half that quantity—that the average cost per beegah of four different soils, including rent, several ploughings and seed, is rupees 3-13-2½, producing upwards of a maund of cotton, which, if well cleaned, and of fair staple, would at any time realize twelve rupees per maund. The concluding paragraph we quote entire, as showing the injurious effects of high assessment.

" When I first came into Bundlekhund, I was in the habit of making advances annually to the ryots for cotton, in the months of July and August, generally at eight rupees per maund, upon the security of the zemindars of their villages. As long as the government assessment was moderate, and the landed proprietors in easy circumstances, the system was profitable and answered remarkably well. This cotton

seldom cost me more than ten rupees a maund, including balance and establishment. The contracts being for the first produce of the fields, it secured me cotton of a most superior quality at a cheap rate. I was obliged, however, to abandon the system altogether when the government assessment was raised. As the zemindars and ryots became impoverished, so the risk of balances increased, and rendered the speculation precarious. As long as landed property remained valuable, the security of the zemindars was considered safe, but they are so poor now, that advances made upon such security would be hazardous."

This is followed by two short communications on Egyptian cotton by Messrs. Gibson and Bell. The experiments of Mr. Gibson for its introduction had in a great measure failed, from the extreme wetness of the season, but, at the time of writing, the experiment could not by any means be considered as brought to a close, so that no conclusion can yet be deduced from it. The same may be said of Mr. Bell's remarks, except in so far as they show what liberties in the way of transplanting may be taken with it, some plants having twice undergone the ordeal, the last time when full grown and covered with pods, apparently without inflicting the slightest injury, but rather with benefit, as Mr. Bell says, " I remark that all the pods which have been latest in coming to maturity are the largest and best." He concludes by giving it as his opinion, that, if attended to, Egyptian cotton will not only flourish, but yield abundant returns throughout India, and recommends its being tried on an extensive scale.

Captain Jenkins, writing from Gowhatty in Upper Assam, thinks that the Egyptian cotton has failed there, though the plants have grown well, as none of the pods had then ripened. This may prove a premature conclusion.

We cannot help remarking the number of instances of half finished experiments recorded in these transactions, a system we cannot approve of, as such records can lead to no useful conclusions.

We mentioned *en passant* that one paper from the pen of Mr. Bell was of a controversial nature, and that we would return to it ; we now do so, considering the subject one of such magnitude, both in its commercial and agricultural bearings, as to merit even a much more comprehensive examination than we can now bestow on it. Mr. Bell's paper is entitled, " Remarks on Dr. Lush's memoir on the cultivation and preparation of cotton in the districts under the Bombay presidency." As we are no parties to the controversy, and as we believe many of our readers are ignorant of its merits, or even of its existence, we shall, in the first instance, present an abridged view of the arguments on both sides, and then make our own comments, beginning with Dr. Lush's paper, which comes first in order.

It opens with an enumeration of the species, botanically speak-

ing, of the genus *Gossypium.* He, following, but going beyond Dr. F. Buchanan Hamilton, reduces the whole series to two, doubtfully three. Hamilton has three, one of which he reduces. Mr. Lush's two species may be distinguished, the first, by having the seeds in each cell of the capsule distinct; the second, by their being combined, and more or less strongly adherent, into a single conical shaped body : neither the ever-varying forms, duration, nor native country of the plant, nor the colour of the cotton, or absence, or presence, of fur on the seeds,* have any weight with him in forming specific differences. The free or combined seeds is his only character; at least such we infer to be his meaning for he does not state it very clearly : hence all our native, or, so called, country cottons, and the long list of introduced nankeen and American sorts, are considered only so many varieties of a single species. The inference from which, at least as we understand him, is, that—as all these varieties are apt, under change of circumstances, to undergo a change of character, and pass from one variety into another, or into new ones, more or less valuable, according as the alteration of soil, climate and culture, has been more or less suited to draw forth the best energies of the plant—it is fruitless labour to try to introduce these foreign varieties into India : for, unless we can provide them with a nearly identical soil and climate, which it is assumed we cannot do, they will speedily revert to the forms now in cultivation, or even deteriorate below that standard, though cultivated with the care and cost of an expensive exotic : and, lastly, that to bestow such pains on an exotic would be worse than useless, because our formerly much despised Indian staple, as it is, daily rises in estimation, and is in such demand for the China and English market, that the quantity exported has risen from eighty or ninety lakhs to three crore of rupees annually, and that now, Surats greatly inferior to those which in 1829 were quoted at $3\frac{5}{8}$ are valued at from 6*d.* to 7*d.* per pound, and the superior sorts, though badly cleaned, fetch a price fully equal to that of Upland Georgia of 1829, owing to the rise of price having suggested new modes of separating the impurities at home, and has rendered a dirty short fibred cotton not so bad an article : therefore, since 5*d.* a pound will give the merchant and grower an ample profit, and while there is so little difference between the price of a dirty and clean cotton, why take the trouble to attempt to alter this comparative ratio, or why need we fear compe-

* M. Jacquemont writes him on this subject, 'I am very sceptical about *Gossypii* species, such as *G. Barbadense*, *G. Arborium*, *G. Vitifolium*, and I do not see any thing in your *G. Cuspidatum* calculated to shake my scepticism, I would swear to *two*, but not even to *three.*'

"However, I confess my scepticism was not confirmed, until I saw further the results of cultivation of American cotton in an experimental farm, and the conversion of green-seeded American into black-seeded cotton like Bourbon."

tition with America, since we know we can stand up against a great reduction of price below the present rates. The great object, therefore, is the extensive production of that variety of cotton in common use, as clean and as carefully prepared as may be consistent with cheapness; that an expensive article may be a fallacious improvement, and that an inferior article, if saleable at all, may be more profitable than a confessedly good one: and, such being the case with our short fibred inferior annual cheap cotton, it must still continue the great staple of India, since the supply of American long staples, must always be sufficient to meet the demands of the market, the proofs in support of these positions are adduced in subsequent papers, and, being superior to ours, will always have the preference.

We believe we shall not be accused of partiality in presenting the above as a fair, or rather indeed favourable, exposition of Dr. Lush's views, as stated in the two first parts of his memoir published in the *Bombay Courier* of the 11th and 15th October, all that Mr. Bell appears to have seen when he wrote his remarks.

Mr. Bell, in his reply, leaves the determination of the botanical question to be dealt with by botanists, but thinks "when Dr. Lush comes forward confidently before the public with a new theory, to which he is anxious all should subscribe, it is time to enquire upon what sort of foundation his hobby is built, and whether practical men will be satisfied with the soundness of his doctrines, when placed in juxta-position with practical proofs."

Alluding to a statement of the Editor of the *Bombay Courier*, that for thirty years fruitless attempts have been making to introduce the foreign varieties of cotton, he observes that it would have been more satisfactory, had Dr. Lush inquired into the causes of these failures, and given them to the public as a preface to his essay, in lieu of a vague theory "wilder, in his humble estimation, than the anticipation of the wildest enthusiasts," as he would then have laid the public under an obligation—that an extension of the principle would equally apply to the non-introduction of other foreign plants, as the Otaheitan sugar-cane, which has been successfully and advantageously introduced —that, whatever weight Dr. Lush's opinions may carry in Bombay, he hopes no one in Bengal will be scared from his good intentions in endeavouring to introduce superior productions, until better proofs are adduced by the publication of the sources of failure. Why does not Dr. L. state on what experimental farm he observed the conversion of green-seeded American, into a black-seeded smooth cotton, and his authority for assuming that black-seeded cotton was in reality from green-seeded American? If there was so much attention paid to the transformation of seed, why was there not equal attention paid to staple?—practical men paying little attention to seed, provided the

cotton does not degenerate; and it by no means follows, that change in the external appearance of the seed is accompanied by depreciation of the quality of the produce:—finally, he rejects Dr. Lush's theory as chimerical, "because he has advanced nothing whatever to convince him, that it is easier to improve indigenous, than it is to establish, permanently and profitably, the superior staples of foreign countries." Dr. L., having mentioned the different qualities of some samples of cotton produced on different kinds of soil, namely, pure black, black sand, and black with nodules of lime gravel, the last infinitely the worst, he assumes, because the result is at variance with those deduced by Mr. Piddington from experiments, that he had not looked beyond the surface, otherwise he would have found a more formidable enemy to the improvement of indigenous and successful introduction of foreign cotton than soil, in the poverty of the cultivators (without however inferring that soil is not a powerful agent), and in their mixing other crops to make the soil yield its utmost; and quotes some instances in illustration from papers in the Transactions. He then goes on to observe that "the foregoing remarks sufficiently account for 'the mixture of dirt and leaves, and the shortness of staple', complained of in the dispatch of the Honorable Court of Directors to the Bombay Government in 1829, alluded to in Dr. Lush's essay, and is laid hold of to establish another important error which the Doctor, in his zeal to make converts to his views, has the indiscretion to publish, viz. 'The fact is, that the rise of price has suggested new modes of separating the impurities at home, and the dirty short fibred cotton now turns out to be not so bad an article.' "

To this it is answered, that, had the author digged deeper, and asked the cause of this extraordinary rise of price, "the answer would have been, extraordinary demand—and whence the demand? The answer would have come home to Dr. Lush, and all who are concerned in the prosperity of Indian agriculture. The skill of the English has ruined our Indian looms, and thrown some millions out of bread. The expensive machinery of the English must be kept going, and if they cannot get good cotton to work up to clothe those whom they have deprived of the means of earning a bare subsistence, why they must take bad, and as they are obliged to take what they can get, it is better that we should plant cotton than starve, and as we cannot afford to buy good cloth, the English will consult our means, and be keeping their wheels in motion, and men at work, by sending us cheap bad cloth." Hence the inference that though bad cotton, rather than none, it does not follow that if better cotton were introduced we should not find a remunerating market, and that, in proportion to the means of purchasing, would be the quality of the manufactured article.

The practical results adduced to prove that foreign cottons, superior

to the country ones, can be produced in India, and the probabilities of their becoming extensively cultivated in the Bengal provinces, we do not think it necessary to recapitulate; for, however satisfactory so far as they go, they are yet comparatively in their infancy, and on too small a scale to admit of any thing beyond prospective conclusions being deduced from them, and can only be looked upon as experiments in progress, but not sufficiently advanced to afford sure data from which to reason, and therefore not fit to be opposed to the experience of Dr. Lush, as given in his succeeding papers.

Mr. Bell concludes his paper with the following comment on Dr. Lush's statement, that the cotton imported (from the interior?) into Bombay, has increased within a few years from the annual value of eighty or ninety lakhs to nearly three crores—" I am at a loss to know from what source Dr. Lush has derived his information, but if the *Bombay Courier* of the 10th May 1836, gives correct views of the cotton trade, the exports of this article for six years ending 1835 inclusive, to China and Great Britain, afford an average 195,118 bales, and, supposing them to contain 300-lbs. each, and estimating the cotton at eight rupees per maund, would give an annual export of something more than fifty-three and a half lakhs in value. How the dealer disposes of the difference, say two crores, I am at a loss to understand. The external commerce of Bengal has not, for many years, been so brisk as it is at this moment, but Bombay will beat us hollow if she takes such fast strides with other products as Dr. Lush has given her credit for in the article cotton."

The extracts we have made from this paper are sufficient to show the style of the author, and the preceding abstract the train of argument he employs. We acknowledge the difficulty of abridging Mr. Bell's writing, but the space we have devoted to his paper, will, we trust, satisfy him, if we have failed in doing him justice, that it is from no want of inclination on our part. To this paper Dr. Lush has published a reply, a portion of which we shall quote, partly with a view of exhibiting a specimen of his style, on which we propose by and by to make some observations, but still more to show how he has evaded the strongest argument brought against him, and which, if inconclusive, ought to have been the easiest answered; thereby leaving the impression on the mind that Mr. Bell has equally the advantage throughout. " I have received Mr. Bell's paper, which is instructive and amusing; of course most of the remarks are answered in those portions of my paper which have been published since he began his commentaries." " It is rather desultory work replying to remarks on a paper, when you are uncertain how much of it has been read, but still very certain that part, that has been read, has not been understood—however, I cannot but feel flattered at the notice taken of my remarks, and hope it will

appear not the least satisfactory point having frightened Mr. Bell. I must take the liberty of beginning at the end of Mr. Bell's paper, and proceeding upward; by this method we discover the source of Mr. Bell's alarm, namely, the great and increasing prosperity of Bombay. Mr. Bell may be assured that I have very good authority for estimating the trade in cotton at very nearly three crores. He says 'the external commerce of Bengal has not for many years been so brisk as at this moment, but Bombay will beat us hollow *(hinc illæ lachrymæ!)* if she takes such vast strides, &c. &c.' "

Here we put it to our readers, to Dr. Lush himself, now that the irritation under which he penned that passage has subsided, to say whether he would be satisfied with such an answer from another, or if that is meeting the question fairly. The accuracy of a statement of his, presumed to rest on official returns, is called in question, on the faith of the correctness of official authorities, open to all, which seems incontestably to prove that his statement is a greatly exaggerated one; and how is the objection met? not by producing his authority, but by telling his readers that Mr. Bell may be assured his statement rests on good authority! This may be satisfactory to him, but not to us; the more so, when we find that, at the rate of sixty-two and a half rupees per candy of 500-lbs., it amounts to the enormous quantity of 240 millions of pounds; or more, by a million, than the estimated produce of the whole of India, and more than half (nearly six-ninths) the produce of the United States.

We trust Dr. Lush will not accuse us of envying the prosperity of Bombay, for we can assure him that none can more heartily rejoice in her success than we shall, when he makes good his assertion, by the production of adequate authority; but, until he does so, we must be excused for withholding our belief in its accuracy, and adding that we think he has weakened all the other statements adduced in reply to Mr. Bell's objections, by shirking the only one which, if his authority be such as he alleges, could have been answered to the satisfaction of all parties, by their immediate production. Having thus far followed Dr. Lush in beginning with the end of Mr. Bell's paper, partly we confess, with a view to show how much he has lost the vantage ground on which Mr. Bell's premature attack placed him, by descending from the elevated tone of scientific discussion to the dogmatizing one of his antagonist; a departure from decorum which can only be excused by allowing for the feeling of injustice done him, under which the reply is dictated; we shall now return to the beginning, and notice a few only of the leading points of difference between them.

After a careful perusal of the whole series of Dr. Lush's papers, it appears to us that their sole object is to prove that labour and care

bestowed, whether by individuals or government, to introduce better kinds of cotton from abroad, is ill spent, because, owing to a late rise in price, the common dirty bazar cotton now brings in the English market nearly as high a price as the Upland American does, and a more remunerating price to the grower and merchant than the finer and cleaner sorts, whether indigenous or imported; and, lastly, that, generally, it is an absolute loss to cultivate the introduced varieties, first, as being all derived from one species, they are exceedingly apt to degenerate when brought among us ; and, secondly, because, being exotics, their culture is so much more expensive than the indigenous ones, that, even where they succeed best, they never repay the extra cost and care required in their culture.

The answer to the first of these propositions, namely, the late rise of price of even inferior cotton, is plain and strongly urged by Mr. Bell, namely, that it originates in excessive demand, arising from the very unexpected and unforeseen circumstance of America being unable to supply good clean cotton, equal to the demands of the English consumption ; and, therefore, to keep their machinery at work, the English manufacturers manage to work with dirty bad cotton, but will, as a matter of course, save themselves the trouble by rejecting bad Indian, so soon as they can get sufficient supplies of good clean American: it is, therefore, we think, a most dangerous argument to urge, that, because Indian cottons at 5*d.* per pound will give an ample profit to the growers, therefore we have no reason to fear " what some please to term competition with America," for even a moderate check to consumption, with an overstocked market, produces a depression out of all proportion to the check ; so that a few millions pounds extra of American cotton, thrown suddenly on the English market, might be productive of the greatest loss and inconvenience to the Indian growers and merchants, how much more so if the supply could be rendered permanently equal to the demand. The way to prevent such accidents is to raise, by care and attention in their culture, our Indian staples to an equality in all respects with the American. That such may, nay, that such will, be produced, we feel quite certain, if not in Bombay, the soil and climate of which seems peculiarly averse to the introduction of foreign sorts, at least in other parts of India. In many parts of Bengal the most promising results are expected, and among us there is not the least difficulty in introducing any kind; our soils and climate seem peculiarly suited to the Bourbon and American cottons, and, so soon as the old prejudices in favour of black cotton soils, to the exclusion of all others for its cultivation, are removed, we may, we think, fairly calculate on rivalling American varieties, the produce of America herself, while our indigenous sorts, raised from similar soils, are often barely worth the trouble of gathering.

Nothing, therefore, it appears to us, could have been more injudicious on the part of Dr. Lush, considering the situation he holds, and the respect which naturally attaches to his opinions, than their publication; without distinctly and unequivocally, at the very outset, limiting them to the tract of country with which he is acquainted. Again, admitting, as we do, the limitation of the genus *Gossypium* to two or three species, and the marked tendency it exhibits to run into varieties, we would deduce the very opposite conclusion, that, namely, which Mr. Bell has drawn, that this very tendency gives us reason to hope for success, which a plant of a more steadfast kind would altogether forbid, and it certainly seems strange to us, that Dr. Lush has not made more use of his opportunities, to procure varieties suitable to the country he occupies, than his paper seems to indicate. To the fact stated, that the quantity and colour of the fur adhering to the seeds is apt to change, we are inclined to attach considerable importance, when viewed in connexion with changes of staple, and think it a subject worthy of more attention than has yet been bestowed on it, and hope that those who have opportunities will not neglect to bestow the attention it merits. To the question of Mr. Bell, "why does not Dr. Lush mention on what experimental farm he observed the conversion of green-seeded American into black-seeded cotton, and his authority for assuming that the black-seeded cotton was in reality produced from green-seeded American?"—we would answer, objecting in the first place to the style in which it is couched, that we think Dr. Lush has supplied most sufficient authority for his statement, when he says *I saw it.*

We must now hasten to a conclusion, the importance of the subject having already induced us greatly to exceed our limits. To Mr. Bell we acknowledge our obligations for calling general attention to a subject, in a national point of view of such vast magnitude, and which, under the weight of an authority generally considered even on this side of India unquestionable, might have suffered serious injury from the publication of Dr. Lush's memoir; but, while we thus approve of the motive, we cannot equally commend the style, which all along impressed us with the idea, that Mr. Bell wrote under feelings akin to personal altercation, in place of those more calm and elevated ones, which belong to the philosophical investigation of a great national question. Much indeed do we regret this departure from the decorum which usually does and always ought to obtain in scientific discussion, where individual interests are not at stake, and the simple elicitation of truth is the object aimed at, because we know the "snappish dogmatical and overbearing style" of his remarks has tended to diminish the

force of his arguments, and to deprive them of much of the effect they were otherwise calculated to produce. On such an occasion the purity of Dr. Lush's motives ought to have been respected, as much as he (Mr. B.) wished his own to be. Dr. Lush was aware that many fruitless and expensive attempts had been made to introduce exotic cottons into Bombay, and he had made many himself; anxious at length to discourage such unprofitable labour, he drew up and published his memoir, neither the arrangement nor style of which are, in our opinion, we confess, the best suited to make the desired impression; and he has, we think, besides erred in generalizing too much: but, in spite of these defects, we do not see that Mr. Bell is justified in accusing him of a wish to repress inquiry, of forming baseless, new fledged theories, of building hobby horses on which he wishes all men to ride as well as himself, for that is the meaning of the passage, though somewhat differently expressed. Dr. Lush has merely detailed the result of his own experience, as any other man would do, and left others to choose for themselves. What else does Mr. Bell do, with this difference in favour of Dr. Lush, that he draws his conclusions mainly from his own experience, in place of from that of others. That Dr. Lush has established his case with respect to India generally, which by the way he does profess to do, we are far from thinking; and even doubt whether his views will ultimately be found to hold good for the tract of country to which they more immediately refer: but, not wishing to fall into the error which we complain of in him—excessive generalization—we presume not to offer any opinion on a country, with the nature of whose climate and capabilities we are personally unacquainted.

We would, however, entreat Dr. Lush to continue his experiments, and furnish somewhat fuller details of the sources of failure, the better to enable us to guard against them, as well as those circumstances which we may expect to operate in our favour, and which, skilfully taken advantage of, may finally ensure success. The characters of the soils, especially with reference to their retentiveness of moisture, as well as their usual state of dryness, or the contrary; their depth, and the qualities of the sub-soil, and whether wet or dry; the nature of the climate, especially with reference to the frequency of rain, and the usual length of the intervals of dry weather; and whether the American varieties were tried on soils apt to crack and yawn during seasons of drought.

In Coromandel, a few trials were sufficient to satisfy experimenters, that the black soils were altogether unsuitable for either the Bourbon or American varieties. For the former the red loamy soils of the interior, that never crack, have been found most suitable, but it thrives

equally well on the gray loamy soils of the coast. The American kinds have been found to thrive in similar soils, but the staple is inferior; it answers well on alluvial soils adapted to the cultivation of rice, but does not require irrigation. It has not we believe been sufficiently tried on sandy saline coast soils, but may be expected to succeed well when tried. The success which has attended trials in such situations, the equal facility of culture with the original country cotton, and the great additional value of the product, bid fair to ensure a rapid spread of this kind of cultivation. Have similar soils been tried on the Malabar coast, and been found equally unsuitable there with the black ones? On this side of the ghauts we believe we may with safety state that irrigation is never employed, unless perhaps occasionally when disappointed of the usual supplies of rain immediately after the sowing season, and before the young plants have acquired substance enough to resist the protracted drought; but, generally, the lands employed are so situated as to preclude the possibility of watering.

Dr. Lush estimates the cost of cultivating perennial cotton at from twenty-five to thirty per cent. more than the annual kinds. It is desirable to know how he arrives at this conclusion, since, on this side of India, the perennial system is usually preferred, as the cheaper mode of cultivation, owing to the great saving of labour and seed which is thereby effected, and still more from the larger crops reaped in the second and third years than the first. Has it been sufficiently tried in Malabar, especially with reference to those sources of profit?

These are a few of many points which still remain to be inquired into, and on which we should wish Dr. Lush to favour us with the results of his experience; and should he think this periodical a suitable channel for making them known, the Society, we feel sure, will gladly receive them. We make this request with a view to elicit information, and therefore trust that all particulars relating to experiments may be as detailed as possible—general results, unaccompanied by a full exposition of the steps by which they were arrived at, we consider insufficient; for the soil, climate, and other contingencies affecting the result of experiments undertaken in Coromandel, in imitation of those made in Malabar, are so different, that unless they can be modified, according to some fixed principle, they may lead to most opposite conclusions.

Tobacco.—The next most important series of papers on commercial agriculture are those on tobacco, but these will not detain us long, as two principal ones have been already re-published in our Journal—that, namely, of Mr. Piddington on soils, and of Mr. Royle on the cultivation of tobacco in India. The others consist of a report on tobacco

produced from Virginia seed at the Society's late farm of Akra. The report is drawn up by dealers and manufacturers of London, who declare the sample in question the best "Indian tobacco they had ever seen," and consider it worth from 6*d.* to 8*d.* per pound.

Madras, we believe, now supplies the English market with tobacco to the extent of about one thousand chests annually, the whole of which sells in bond at these prices. This is excellent encouragement, as we believe the average price of real Virginian tobacco does not exceed that amount, and we have been informed, unless we mistake, that it is placed in the bond warehouse at about 2*d.* per pound, thus affording an average profit of nearly 200 per cent.

Mr. Piddington gives an account of some very good tobacco which he raised on an ordinary dark gray or black soil, and which he, so to speak, manured with iron by putting a handful of "Soorky," (what form of the metal that is we are unable to inform our readers) into each hole when transplanting. The experiment of course must go for nothing, as the circumstances in which it was made were unfavourable, and no comparative trial was made to ascertain the effect of the iron by planting so many more without, and then treating them in all other respects the same.

Some Cabool seed, which was sown in Salem, and treated in the same manner as the Virginia is in that district, produced a fair crop of rich fine tobacco, in spite of the season proving somewhat unfavourable, and the plants being slightly attacked with mildew. We shall probably return to this subject. We cannot close our notice of this volume, so replete with information, without expressing a hope that we may annually have an opportunity of passing in review, and bestowing on each occasion our humble meed of applause, at least a similar volume of Transaction of the Agricultural and Horticultural Society of India.

R. W.

XV.—Selections.

Historical Sketch of the Kingdom of Pándya, Southern Peninsula of India, by Horace Hayman Wilson, Esq. *Boden Professor of Sanskrit, Oxford.*

The following sketch of the history of the principality of Pandya, one of the earliest political divisions of southern India, was compiled several years ago, from documents contained in the manuscript collections of the late Colonel Mackenzie. It was prepared before the completion and publication of my catalogue of those collections, and it was my intention to have revised it at some future period, with the assistance of such further materials as a more thorough examination of its authorities might have supplied. At the same time, I commenced similar epitomes of the history of the other chief states of the Peninsula, purposing in like manner to give them the benefit of future revision and comparison with additional sources of information. Time, however, passes away, and I have not had any opportunity of carrying my intentions into execution. When such an occasion may offer is still uncertain, and I have thought, therefore, that it may not be unacceptable to the Royal Asiatic Society to be put at once in possession of what I have effected, at least as far as relates to the kingdom of Pandya. From my subsequent investigation of the Mackenzie Collection, I do not expect that any material accession to our knowledge of the remote condition of the Pandya kingdom will be derived from it; but, at any rate, so much as is here supplied will, in the mean time, contribute to throw some light upon a dark period of Pandya history, and may pave the way for its more complete and more successful elucidation.*

The historical traditions of the south of India divide the extreme southern portion of the east part of the peninsula, which is termed Drávira Désa, into three principalities, or those of Pandya, Chola, and Chéra. The first of these is the subject of the present inquiry. The early existence of the Pandya kingdom we learn from classical authorities.† At the beginning of the Christian era, the Regio Pan-

* A list of the authorities will be found at the end of this paper.

† The author of the *Periplus of the Erythrean Sea*, particularises Nelcynda, or Neliceram ; Paralia, Malabar, or Travancore ; and Comari, Cape Comorin ; as ὑπὸ τὸν βασιλέα Πανδίονα, under king Pandion. Dr. Vincent conjectures, that the king of Madura had extended his power from the eastern to the western side of the peninsula, and was master of Malabar when the fleets from India first visited the coast (vol. ii. 401). He also thinks it likely that the power of Pandion had been superseded in Malabar between the age of the Periplus and Ptolemy; for Ptolemy reckons Aii next to Limurike on the south, and takes no notice of Pandion till he is past Cape Comorin (ibid). The conjecture derives very strong support from the traditions of these countries. It may be supposed that the embassies sent by Pandion to Augustus, as noticed by classical

dionis, of which Madura was then and ever afterwards the capital, appears to have comprehended the greater part of the southern portion of the Coromandel coast, and to have extended across the peninsula to Canara and Malabar, and southward to the sea. It was subsequently confined to narrower limits by the independence of Malabar and the rise of the state of Chéra to the west, by the growth of the principality of Ramnad to the south, and the aggrandisement of the Chola sovereignty to the east, till it sank, in modern times, into the petty government of the Náyaks of Madura. At various periods of its history it may be presumed, the following definitions of its limits have been laid down by native authorities. One account places Raméswara on the east, Kanya Kumári on the south, Satyamangalam on the west, and the river Palar on the north. Another, which seems the more accurate, makes the Valar river the northern boundary, and Paruvali the western; but agrees with the preceding in carrying the Pandya territory to the sea, both to the south and east, including, consequently, the present Ramnad, and part of Tinivelly.

The Coromandel provinces on the eastern peninsula, from the Godaveri to Cape Comorin, are described in all the traditionary accounts of this part of India, as one vast tract of forest to which the name Dandaka, or Dandakàranya was applied. It was in these thickets that Ráma and Sitá resided during their exile, that he commenced his warfare against the Rákshasas, or savages and fiends, who divided with hermits and sages the possession of the wilderness, and that Sitá was carried off in resentment of Ráma's successful attacks upon the wild tenants of these shades. After the subjugation of the savage inhabitants of Dandakáranya and the conquest of Lanká, various individuals from the north, it is said, attracted southwards by the performance of pilgrimage to the scenes of Rama's triumphs, were tempted, by the unoccupied state of the country, to settle themselves and their families upon the undisputed territory. They accordingly cleared and cultivated different tracts, and thus laid the foundation of future principalities. To such circumstances the Pandya kingdom owed its rise. An adventurer, named Pandya, of the Velálar, or agricultural tribe, first established himself in that portion of the south to which his

authorities, and which there is no reason to call in question, arose out of the ambitious extension of the territories of the Pandya prince: two occurrences of this nature are noticed, one the 18th year after the death of Julius Cæsar, which reached Augustus at Tarracona; the other six years afterwards, when that prince was at Samos. Et quidem duplex erat illa ad Augustum legatio, cujus utriusque tempus habemus exploratum; prior bello Cantabrico quam Tarracone Augustus accepit, teste Orosio (vi. 21). Secundam deinde legationem anno Varr. 734, assignat Dio (l. liv.), quo tempore Sami hyemavit Augustus. Hos vidit, ni fallor, legatos, Nicolaus Damascenus, Antiochiæ Samum, ut videtur, petentes, teste Strabone (l. xv. p. 719). DODWELL, de Ætate et Auctore Peripli Maris Erythrei, 105.

name was afterwards assigned.* This happened, according to the authority followed, in the last *yuga*, or *age*, in which seventy-two princes are enumerated as ruling over the kingdom. Other accounts, however, do not name the founder of the monarchy, but pass over some indefinite interval to the reign of Sámpanna Pandya, whose son, Kùla Sèk-'hara is, in all the lists, specified as the first king of Madura, from his being regarded traditionally as the founder of that city. It is from this prince that seventy-two kings are enumerated in the list above referred to.† Another list,‡ said to be taken from the *Madura Purâna*, but, if so, not very accurately compiled, reckons seventy-five princes from Soma Sundara, the third of the preceding list, to Kuna Pandya, who appears to be its seventy-third. Another list limits the number of kings from Kula Sék'hara to Kuna Pandya to thirty,§ whilst it is stated generally, in a different authority, that the whole number of Pandya kings who preceded Kuna Pandya, amounted to three hundred and fifty-seven :|| it is evident, therefore, that beyond mere names, and those, perhaps, more fanciful than historical, we are not likely to derive much satisfactory information from these conflicting statements. It may, indeed, be observed of such lists,¶ and they are numerous, that they bear their own refutation when they assert very high antiquity. The names are from the first Sanskrit; but, according to the most able scholars in the languages of the Dekhin, there was a period which preceded the infusion of Sanskrit** into the dialects of the south, and the princes of those periods were, of course, not designated by exotic appellations. Either, therefore, the first names of the lists are modern fabrications, or the lists ascend to a comparatively recent date. There can be no doubt, that in examining local lists of Hindù kings in the peninsula, both sources of error, or misrepresentation, are to be taken into account.

The objection advanced against these lists applies equally to all the

* No notice of any of the kingdoms of the south could consistently occur in the Ramayana. Manu speaks of the Dráviras as degraded Kshetriyas, but makes no mention of Cholas or Pandyas. Both Chola and Pandya are respectively mentioned in the Maháb-hárata, but their origin is not there described. The Harivansa and Agni Purána, make Pandya, Chola, Kerala, and Kola, great-grandsons of Dushyanta, of the line of Puru, and founders of the regal dynasties named after them. The descendants of Dushyanta, however, as specified in the Vishnu Purána, do not include these personages, and their insertion seems to have been the work of the more recent authorities. The Harivansa, with no little inconsistency, places the Pandyas and Cholas amongst the Kshetriya tribes degraded by Sagara. The Padma Purána has a similar addition to the list of those tribes in the Rámáyana.

† List of authorities, No. 1. ‡ List, No. 3. § List, No. 2.

|| Rájá Cherití. List, No. 5.

¶ Besides those comprised in the Mackenzie Collection, Buchanan has published several. (Travels in Mysore). Some of his and those of this collection are the same, having been procured at the same places.

** Ellis and Campbell. Introduction to Campbell's Telugu Grammar.

written records, and is alike fatal to the extreme antiquity of the events which they narrate. The meagreness and inconsistency of the various sources of information might throw a suspicion upon the existence of the Pandya monarchy at any remote period, did not classical writers bear testimony to the celebrity even of its capital city, at the very commencement of our era. How long before this it was founded we have scarcely any means of conjecturing, but the traditional history of the Chola dynasty records the disappearance of that race, as independent princes, to have occurred in consequence of the marriage of a Chola princess with Vara-guna Pandyan, whom it calls the forty-eighth Pandya king. In our lists, however, he appears to have been the twenty-second or twenty-ninth, and supposing the union of the Chola and Pandya sovereignties to have been thus effected before the reign of AUGUSTUS, and the number of preceding reigns not very erroneous, we may conjecture the appearance of the Pandya principality as an organised state, and the foundation of Madura to have happened, about five or six centuries anterior to the Christian era.* Of the events that have befallen the kingdom during the long period that has since elapsed, very few are attributed to remote times, and of them the authenticity may be doubted. Such as they are found, however, in the only records that remain we shall proceed to detail them, omitting the most extravagant fictions, and curtailing the most tedious of those which we select.†

* It is not improbable that some centuries preceded the foundation of Madura, during which the first settlers were occupied in clearing the ground and erecting habitations, and forming themselves into organized states. According to the Puránas, as estimated by HAMILTON, ten centuries were thus occupied; but this seems to be more than requisite, and perhaps five would be nearer the truth, placing the first establishments in the south about one thousand years before our era.

† The authority followed in the first part of the ensuing detail is called a translation of the *Madura Purána* (List of Authorities, No. 7); it appears to be a translation of the Tamil work called *Tiruvalaiyádal*, which is also designated sometimes as the *Madura Purána*. This is the work of Parunjoti Tamburan, a Pandaram, or Saiva priest, who is said to have written it in the reign of Hari Víra Pandyan, in the Salivahan year 973 (A. D. 1051). It relates the sixty-four miracles or frolics of Sundaréswara, the tutelary divinity of Madura; and is, in fact, but a translation or paraphrase in Tamil of a Sanskrit local legend, entitled *Hálásya*, said to be a section of the *Skanda Purána*, a source always assigned in the Dekhin to detached local compositions, to which the composers wish to affix the authority of Pauranic sanctity. The Skanda Purána being a Saiva Purána, is the ready resource of that sect, and is made the parent of a much more numerous offspring than legitimately belong to it. The *Hálásya* is of this description; but if the date of its Tamil representative be correctly given, it is of use in fixing that of Kuna Pandya, with whose reign it closes. The collection contains two MSS. professing to be translations of the *Madura Purána:* they do not exactly agree, however; and one is much more brief than the other, whence it is possibly the translation of an abridged work, the abridgment not adhering, with inviolable fidelity, to its original, as is usually the case amongst Hindu writers. The MSS. are Nos. 7 and 8 of the List of Authorities. The account of the work and its author, is from a MS. list of Tamil authors, and the catalogue of Tamil books. Another MS., No. 11, which has been also

According to the *Madura Purána*, the residence of the Pandya kings was for many ages at a place called Kurk'hi, not improbably the Kolkhi of the Periplus, a city subject to the Pandya king, as the author observes, and, perhaps, as D'Anville notices,* still to be traced in the appellation Kilkhar, or Kilakarai,† on the Coromandel coast, opposite to Ráméswaram. One of the Pandya monarchs, named Sámpanna Pandya, invited the Chola and Chéra princes to the wedding of his son. On their way to Kurkhi they were caught by violent rains, and compelled, by the flooded state of the country, to remain encamped on one spot for a month, in memory of which event the Pandya king built a city there, naming it Kalyána-pur, which was for some time the capital of his son and successor, Kula Sék'hara.

Kula Sék'hara, in the commencement of his reign, built a new city about two leagues to the north of Cape Kumari, which he named after himself, Kula Sék'hara Pattan: he resided, however, at Kalyána-púr. It happened that a merchant returning from a journey to Malayálam, or Malabar, lost his way in the forests of Chandragiri, the hilly district west of Madura, and its vicinity. Whilst exploring his track alone he discovered an ancient temple, dedicated to Siva, as the Mula Linga, or Choka Náyaka, and Durga, as Minákshi Amman. The temple had been erected by Indra when performing penance in the Dandaka forest, for the expiation of the sin of murdering Vritrásura, who, although a demon, was a Brahman. The merchant, himself a devout worshipper of Siva, paid his homage to the deity, and was, in consequence, favoured with a personal communication, directing him to announce the discovery to the Raja, and the will of the god, that a city should be founded on the spot. The same injunction was conveyed in a vision to the prince, and the concurrence of these intimations established their divine origin. Kula Sék'hara accordingly repaired to the place, cleared the forest, rebuilt the temple with great architectural magnificence,

consulted, is entitled a translation of the Pandya Rájákal; the original of this is a Tamil prose work, sometimes attributed to the three most eminent of the first professors of the Madura college Narakira, Bána, and Kapila. The accuracy of this notion may be questioned, as it rests solely upon the work closing with the reign of Vamsa Churámani, under whom these writers are said to have flourished; and it is contradicted by the tenor of the last sentence, which speaks of the literary institutes first promulgated by, or exemplified by these teachers having been communicated to their disciples, and thus handed down through consecutive generations. The work itself agrees closely with the *Madura Purána*, and is, therefore, probably, as well as it, a branch from the same Sanskrit stem, the *Hálásya Máhát'mya*, which work is also in the collection, and has been compared with the translations.—Mackenzie Collection, I. p. 91, cxxi.

* D'Anville Antiquité Geographique, 122. Also Vincent's Periplus, ii. 443: the general identity is beyond question by its being then, as now, the scene of the pearl fishing.

† See Journal Royal Asiatic Society, No. V. p. 169.

constructed a splendid palace for the royal residence, and founded an extensive and stately city. The gods beheld the progress of his labours with interest, and, on their completion, a shower of nectareal dew descended from heaven, spreading a sweet film upon the ground, which gave the appellation Madhura (sweet) to the new city. The stately monuments, of which the vestiges are still to be seen in Madura, are the work of much more modern times; but the classical authorities already referred to, establish, for that city, an existence of venerable duration. The gradual transfer of the Pandya capital from a southerly to a more northerly site, is in harmony with the tradition of the country being first cleared and cultivated by pilgrims to Ráméswaram. It may be here observed, that the prevailing form of the Hindú religion in the south of the peninsula was, at the commencement of the Christian era, and sometime before it, most probably that of Siva, as, besides the positive testimony of these legends, the name of the cape, Komári, or Kumári, the virgin, is, as a mythological appellative, restricted to Durgá; and that it was in this place a mythological name is proved by the author of the *Periplus*,* who states, that persons purposing to lead a religious and widowed life bathe at Comar, because, as the history relates, a goddess formerly used to perform her ablutions monthly at this spot.

The second Pandya prince is named Malaya Dhwaja, of whom his extreme devotion to the tutelary divinities of his capital is the only peculiarity recorded.† In return for his attachment, the goddess Minák-

* Ἀπὸ δὲ ταύτης ἐστὶν ἕτερος τόπος τὸ Κομὰρ λεγόμενον. ἐν ᾧ τόπῳ φρούρια ἐστὶν, και λιμήν. ἐις ὃν οἱ βουλόμενοι τὸν μέλλοντα αὐτοῖς χρονον ἱεροὶ γενέσθαι, χῆροι μένουσιν ἀυτοῦ, ἐκεῖ ερχόμενοι ἀπολούονται, τὸ δ'αὐτὸ καὶ γυναῖκες. ἱστορεῖται γὰρ τὴν θεὸν ἐκεῖ ἐπὶ μῆνας κατά τινα χρόνον ἐκεῖ ἀπολελοῦσθαι.

Paolino says, the convent and the custom still existed in his time.—Vincent Periplus, ii. 443. See, also, Viaggio Di Fra Bartolomeo.

† The traditions of the south, however, make him a more important character, and consider him as the father of Chitrángadá, the wife of Arjuna. This opinion is grounded on a section of the Sabhá Parvan of the Mahábhárat, where Sahadeva, whilst performing his military career in the Dekhin, is described as having an interview with his father-in-law Malaya Dhwaja, king of Pandya. This section, however, is perhaps peculiar to the copies of the Mahábhárat, current in the peninsula, as it has no place in a fine copy in Devanagari character, in my possession. In the first chapter, too, it is there said that the father of Chitrángadá is Chitraváhana, king of Manipur, to which Arjuna comes on leaving Kalinga. The Telugu translation of the Adi Parvan agrees in the names of the parties, but places Manipur south of the Kávéri. How far, therefore, it is safe to identify Malaya Dhwaja with Chitravahâna, and Manipur with Madhura, must depend upon the verification of the authenticity of different copies of the Mahábhárat. The result of a careful collation of seven copies at Benares, examined at my request by Captain Fell, may be regarded as fatal to the identification, not one of them containing the section in question, or the name of Malaya Dhwaja. The Bhágavat calls the bride of Arjuna, Ulupi, the daughter of the serpent king of Manipura.

shi herself became incarnate as the daughter and the successor of this prince.

Múmulai Tadátaki, the new queen of Madura, was a warlike princess. She subdued, it is said, the whole of the peninsula, and carried her arms over northern Hindustan to the Kailása mountains. Here her victorious career terminated in an event more glorious than her preceding triumphs. She was opposed by no less a person than the god Siva, by whom she was defeated and taken a prisoner. It was now her turn to vanquish: the god became enamoured of her charms and allowed her to return in liberty to Madura, whither he followed her and obtained her hand.* Having assumed a human form of great beauty, the god was known by the title Sundara (the handsome) Pandyan; and although it does not appear how he attained the privilege of giving a cognomen to the emblem of himself, worshipped in Madura, yet the Múla Linga is most commonly known by the name of Sundaréswara, the god of Sundara, which it shares with that of Choka Náyaka.

That this tradition is not wholly without foundation is established by several circumstances, if we look to its implied rather than to its literal import. It is not improbable that the worship of Siva was introduced into the peninsula from northern Hindustan some few centuries before the Christian era, and that, in the reign of one of the early princes of Madura, it was established in that city. The tradition which peoples the peninsula from the north of India, and the existence of the Saiva faith there, coeval with the era of Christianity, are fully in harmony with the account given of Sundara Pandyan. In further confirmation of the native country whence the Tamil faith was derived, it may be observed that Sanskrit, which, in Drávira Désa, as in every other Hindu country, is the language of religion, is always called by Tamil writers Vádá Mozhi,† the northern speech, and, finally, the learned writer from whom the remark is taken, observes, that the literature and religion of the Brahmans were brought by them into the peninsula from northern Hindustan.‡ Whether this occurred at so early a period as the one now under discussion may be doubted, although some of the circumstances we have adverted to are in favour of the supposition. That there are, on the other hand, reasonable bounds to its antiquity cannot be disputed; for, besides the inference derivable from the traditions relative to the colonisation of the peninsula, we

* The legend relates, that the princess was born with three breasts; the centre one was to disappear when she met with a suitable spouse, and, accordingly, vanished upon her encountering Sundaréswara. Images of the goddess, with three breasts, are still seen amongst the sculptures at Madura.

† Ellis's Dissertation on Malayalam, p. 3, note.

‡ Ibid, p. 26.

have the testimony of Menu,* that the Draviras were classed with the impure, or outcast tribes, when those institutes were compiled ; and, even in the Mahábhárat, the people of the southern countries appear to be considered as scarcely Hindus.

Sundara and Minákshi, after a reign of some thousands of years, resumed their celestial characters, and returned to heaven. They were succeeded by their son, Wugra Pandyan, who, as the offspring of Siva and Déví, was, of course, an incarnation of Kártikéya. Eastward of Madura is the mountain Tiruparumkunru,† whence fell a stream, named Sarovara Vaikál. Agreeably to the system of local adaptation which seems to have especially prevailed in the Dekhin, and which transferred the names of sacred places in the north of India to others in the south, this mountain became another Kailása, and the stream, another Ganges. The scene and chief actors being thus identified, we are not to be surprised that the birth of Wugra should have been here attended with the circumstances narrated by the Purànas of the birth of Skanda, or Kártikéya, and that this site acquired the honours of a Tirt'ha, or place of pilgrimage, under the presidence of Subrahmanya,‡ another name of Kártekéya, who was, from a remote date, a favourite deity with the nations of the peninsula.

Wugra Pandyan, being of such exalted origin, was engaged in conflicts proportioned to his rank, and, after subduing the kings of earth, waged war against the king of heaven. Indra, being discomfited by him, was compelled to grant the showers which he had forborne to shed upon the Pandya kingdom. Wugra was married to Kántimati, the daughter of the Chola king, and by her he had Víra Pandyan, who succeeded him.¶

* Book x. 5.

† The most famous place under this appellation, Subrahmanya Kshetram, or Tirt'ha, is in the province of Canara. A hill to the south of Madura, denominated, from ideas connected with this superstition, Skanda Malai, the Mount of Skanda, another name of Kártikeya, or Subrahmanya, has suffered a very curious change, Skanda Malai being converted into Sicander Malai, the hill of Secander, or Alexander. Les naturels croient que le médecin ordinaire d'Alexander le Grand y a été enterré. LANGLES, ii. 11. A native account says it is the tomb of Alexander himself ; an idea, no doubt, introduced by the Mohammadan Fakirs, of whom many reside on this hill, and attach a profitable sanctity to the small tomb, once a temple of Skanda, now the shrine of Secander. To the Hindus it is equally sacred, as it is said to contain in one of its caves an image of Skanda, which they go to worship.

‡ This appears, however, from some accounts, to be the same as Skanda Malai (MS. No. 80), which is three or four miles south-east of Madura.

¶ One account, the Raja Cheritra, vol. vi., makes great confusion with this prince and his predecessors. It calls him Alaka, and makes him the father of Minakshi, married to Chokanath, and of Alyarasani, married to Arjuna. At the same time he is described as the son of Malaya Dhwaja, and grandson of Sundara, an order of descent very different from all the other authorities.

Víra Pandyan was killed, whilst hunting, by a tiger: he left many sons by the women of his household, and one, the youngest, by his queen, whom the ministers placed under the tutelage of the Chola monarch, to secure him from the treachery of his elder brothers. When old enough he was conducted to Madura, and installed; upon which, his brothers fled to Chera; they do not seem to have given him any subsequent molestation. This prince was named Abhishéka Pandyan; he was succeeded by Vikrama, of whom no traditions are given; and he by Raja Sek'hara,* in the time of which latter, it is said, the Chola prince led an army of Samánals, or Buddhists, against Madura. He was defeated; but no consequences of his repulse are recorded. The next sovereign of Pandya-desa is named Kulottunga, in whose reign we have abundant legends illustrative of the might of Choka Nátha, but nothing that can be conjectured into history. He was succeeded by his son, Anantaguna, in whose reign the kingdom was again invaded by the Samanal; but, with the aid of Siva, the assailants were repulsed. On this, as on the former occasion, the heretical invaders are conducted by the Chola monarch, whose seat of empire is called Kánchí, or Conjeveram. That the territories of the Chola prince lay higher north than the modern Tanjore there is probable evidence in other manuscripts, as, also, that Conjeveram was included within his dominions. That it was the ancient capital of Chola is, however, quite irreconcilable with all the local accounts which have been procured of that empire, and the foundation of Kánchí itself appears from them to be an event of comparatively recent occurrence. The same accounts, however corroborated by the vestiges of Bauddha architecture, found still abundantly at Conjeveram, attest the prevalence of that faith there for some considerable period. This might have been the case at the time the legendary tales which profess to record the Pandya history were compiled; and hence, these supposed religious aggressions emanating from the Chola monarchs of Conjeveram. That frequent contests between the Chola and Pandya princes occurred in remote periods there is no reason to doubt; but it is not quite so certain that the particular occasions are specified with much accuracy, or that hostilities, embittered by religious differences, disturbed the tranquillity of the Dekhin some centuries before the Christian era.

Anantaguna was succeeded by his son, Kula Bhúshana, in whose reign, it is said, in the Pandya Rajakal, that the Pandya kingdom

* All the lists agree in inserting Vikrama's name. The translation of the *Tiruvaleyádal* omits him making Raja Sek'hara the son of Abhisheka.

was invaded by Kiráta Raja, sovereign of Chédí, but it can scarcely be supposed, that by this is intended the country usually identified with Chédi, or Chandail, in central Hindustan. The appellation, Kiráta, assigned to the Raja, indicates a mountaineer, the wild inhabitant of thickets and fastnesses, subsisting by plunder and the chase; and in the Tiruvaleyádal, the invader is designated with more consistency, as the Sétu Raya, the prince of Marawa, the district lying east of Madura along the sea-coast, and which would, therefore, appear to have been an independent principality in ancient as well as modern times. The minister, Sundara Sumantra, had been provided with funds to levy a force to oppose the invaders, but he appropriated the money to the worship of Sundarèswara, and the invaders had nearly reached Madura before any troops were collected to resist them. In this predicament the minister had recourse to the god, and a miraculous host, representing the contingents of the fifty-six kingdoms of India, was immediately created for the defence of the kingdom. Against such combatants no chance of success remained for the invaders, but Kiráta, or the Marawa Raja, was removed even without their aid. He was killed by a lion sent by Siva,* and, upon his death, his followers fled in confusion to their native haunts. The result of this invasion was, therefore, only an accession of honour and devotion to Sundarèswara and Minákshi Dèví.

In the reign of this prince another marvel is recorded, which merits notice only so far as it accords with the general traditions of the origin of Conjeveram. Kántára Kháta Chola is said to have cleared the woods which covered that part of the peninsula; built the city of Kánchí on the site; and erected the pavilion and temple of Ekámbarèswara and Kámákshi-Dèví, the forms in which Siva and Durgá were worshipped at that city until very recent periods. In recompense of this prince's devotion, Siva conferred upon him aerial locomotion with the speed of thought, and thus enabled him to transport himself every morning to Madura, to pay his homage at the supreme shrine of Sundaréswara—a rather indifferent compliment to his own tutelary divinity.

Kula Bhúshana left two sons, Rájendra and Rájasinha, of whom the first succeeded to the throne. The Chola prince of Kánchí, Kantára Kháta, or, as he is named in the Madura Purana, Kandavetti, proposed an alliance with Rájendra, by giving him his daughter in marriage, to which the Pandya prince assented, and sent his brother, Ràjàsinha, to conclude the negociation with the Chola prince. The ambassador, however, prevailed upon that monarch to wed his daughter

* The scene of this event is laid by the *Tiruvaleyádal*, in the forest Tirupúvanam, at a place dedicated to Siva, as Purána-lingam, ten miles south of Madura.

to him instead of his brother, and to co-operate with him in an attempt to drive Ràjendra from the throne. The confederate princes marched towards Madura for that purpose; but they were encountered by the Pandya king, defeated, and taken prisoners. Ràjàsinha was detained in confinement during the rest of his life, but the Chola monarch was released and dismissed with civility to his own dominions.

Saundarya Páda Sek'hara, the son of Rajendra, succeeded his father. Like his predecessors, he is said to have been engaged in hostilities with the Chola monarch; and, whatever we may think of the circumstantial details of these repeated conflicts, it seems not at all improbable that a struggle for supremacy in the peninsula did exist, at a remote date and for a long period, between these rival dynasties, which terminated in the temporary ascendency of the Pandya monarchs. On this occasion it is related, that the Pandya king was forced to fly before his invaders, but their prince was drowned in the pursuit of his defeated foes, and the kingdom of Madura was thus preserved from foreign subjugation. Of course, the accident was not a mere casualty, but was brought about by the seasonable interference of the tutelary deities of Madura. Saundarya Pàda died soon after his return to his capital, or, as it is said of every Pandya prince, he went into the *adytum*, or inner chamber, of the temple of Múla Linga, and was united to the god. If we do not suppose that this was a contrivance of the priests to get rid of those princes of whom they were tired, or with whom they were dissatisfied, we must conclude the ceremony to have been part of the religious institutes of the kingdom, and that the princes and persons of note were carried to the temple, to die in the presence of the tutelary gods, in the same spirit as that which, in Upper Hindústàn, conveys the expiring individual to breathe his last upon the banks of the Ganges.

Varaguna, the son of the last prince, succeeded. His reign contains the usual proportion of marvels; but nothing of a historical character in the authorities hitherto followed. This omission is the more remarkable, as the Chola records ascribe the disappearance of the series of their princes to the transfer of the kingdom to Varaguna, by his marriage with a Chola princess, as has been noticed above;* and the union of the two principalities under a common sovereign appears to have actually occurred about the period at which this prince may possibly have reigned. The fact is supported by another

* According to the *Chola Désa Púrvika Charitra Vyakhyanam*, Váraguna was the son of Balachandra Pandyan. His wife was the daughter of Kulottunga Chola. Their descendants occupied the united Pandya and Chola kingdoms, for twelve generations and five hundred and seventy years.

authority, however, and a cheritra, or history of Varaguna,* states his repulsion of an invasion by the Chola king, Karàvar Chola, his subsequent conquest of that kingdom, and its annexation to the Pandya monarchy. A celebrated poet, named Bàna, or Pàna-patra, is said to have flourished in this prince's reign.

Vara Raja, or Raja Rajendra, succeeded Varaguna. In his reign a ridiculous legend is narrated, which so far merits recapitulation, that traces of it are frequent in the sculptures still visible at Madura.

At Kuruvaituri, west of Madura, a rich farmer had twelve sons, who spent their time in various sports, and especially in the chase. They one day attacked a wild hog and his family, killed some, and pursued the rest to the vicinity of a holy sage engaged in profound meditation. Having disturbed the abstraction of the sage, he cursed them, denouncing their future birth as hogs themselves. On their humiliation, however, and earnest prayers for forgiveness, he so far modified his imprecation as to make the temporary degradation the means of future honour and fame.

The twelve youths being reborn in their porcine capacity, lost their tender parents by the spears of Raja Rájendra and his fellow-sportsmen, whilst they were yet too young to provide for their own subsistence. Their pitiful state moved the compassion of Choka Náyaka and Minákshi Amman, who happened to be in the forest during the chase, and they determined to act as the parents of the porkers. Minákshi officiated as their nurse, in which character figures of her occur, and Choka Náyaka as their tutor. One effect of this divine protection was to humanise their bodies, so that they became men with the heads of pigs, in which combination their statues are sculptured.† Another consequence of their fortunate destiny was their deriving from their preceptor profound conversancy with arts, sciences, and letters, and their consequent advancement to the ministerial administration of the affairs of the Pandya kingdom.

The reign of Raja Rájendra is followed by an interval which is imperfectly filled up in most of the authorities by a mere string of names. The enumeration does not exactly agree in all cases; but in those which are the most authentic, it appears to extend to twenty-four or twenty-five princes. If we allow twenty years to a reign, and admit the accuracy of the enumeration, we should place the prince who succeeds these shadows in the second century of the Christian era: at the same time, as the data are altogether insufficient, it is obvious, that

* List, No. 13.

† They are described as occurring in Tirumalla Náyak's *Cholitri*, by Mr. Blackader, Archæologia, vol. x 457; and his description is translated in Langles' Monumens de l'Hindoustan. Instead of ministers, however, Mr. Blackader calls them princes of the palace; and M. Langles converts them into *huissiers de la chambre*.

any conclusions advanced must be subjected to a considerable latitude, and that, consequently, the real date of Vamsa Sek'hara's accession cannot be determined with any degree of accuracy. It is quite sufficient to bring it within some moderate limits, and to place it not only upon this computation, but on various other grounds, in the early centuries of our era.

At whatever period it may have occurred, the accession of Vamsa Sek'hara seems to have been the result of some political disorganisation of the Pandya kingdom, as the different authorities concur in considering him as the founder of a new dynasty. The *Madura Puràna* describes him as the first prince who reigned after the recovery of Pandyam from the waters which had deluged the world, and as receiving from Múla Linga, instructions for the readjustment of the limits of the kingdom; in which latter account the different authorities concur. They also agree in representing him as the founder of the fort and palace of Madura, of various temples and public buildings, and as the restorer or enlarger of the ancient city. It is not improbable, that the extensive remains of these buildings still in existence, and calculated by their massiveness to defy the unassisted effects of time, are, in part, relics of the works of Vamsa Sek'hara. The fort of Madura is at present about three miles and three-quarters* in circumference, and includes the ruins of the palace, the temple of Choka Nat'h, and the Choltri of Tirumalla Nayaka. The latter is a modern building: and the same period witnessed considerable additions to the palace, which, probably, occasioned the mixture of Indian and Saracenic architecture observed by Daniel; as, in the fifteenth and sixteenth centuries, the latter seems to have been introduced from Persia by the Mogul emperors, and engrafted upon the square and massive, although florid, style, which may be regarded as exclusively Indian. This style is evident in the pagoda of Choka Nat'h and its adjoining arcades, and bears testimony to their claims to very respectable antiquity. Vamsa Sek'hara is said to have also re-established, or possibly he introduced, the practice of carrying the god abroad, on particular festivals, in large cars magnificently ornamented, and dragged by the people.†

The reign of Vamsa Sek'hara was also distinguished by an event which led to important consequences to the literature of the peninsula, and which is one reason for placing his reign in the earlier ages of Christianity. This was the foundation of a College at Madura, for the cultivation, it would appear, of profane literature and the Tamil language. The different authorities agree in this account, dividing the merit of the act between Vamsa Sek'hara, and his son and successor,

* Hamilton's India, vol. ii. p, 469.

† Le Père Bouchet au Père * * *, Lettres Edifiantes, vol. xiii. p. 126; Blackader, Archæologia, vol. x.; Daniel's Oriental Scenery; and Langles' Monumens de l'Hindoustan, vol. ii.

Vamsa Churàmani, also called Champaka, who, probably, completed what his father only commenced.

The professors of the Madura college were at first forty-eight in number, called the *sangattár*, or assembly. The chief of these were Narakira,* Bána, and Kapila, of whom no works remain. These received instructions in the *Sútras*, or rules, of the Dravira language, it is said, from the god Siva himself, who appeared amongst them as the forty-ninth professor, and enabled them to expound and propagate the primitive institutes of the language, which are invariably attributed in the Dekhin to the Muni Agastya. The cultivation of the Tamil language, as has been noticed above, is supposed by Mr. Ellis to have preceded that of Sanskrit in the south; and this would be a circumstance in favour of the early existence of the *sangattár*, for it could not have been long after the Christian era that the fables of Northern India were domesticated in the peninsula. However, the opinion evidently is correct only within certain limits. The Sanskrit language, in prayers, hymns, and legends, must have accompanied the introduction of the Saiva faith anterior to the Christian era, and must have been cultivated as far as it was connected with religion. Its profane literature, and even its Pauranic mythology, may have subsequently become objects of study; and they apparently superseded the cultivation of the native tongue, till the eighth or ninth century after Christianity, when its revival was effected, as we shall hereafter have occasion to notice.

The prominent figure which Agastya is thus made to assume in the literary history of the south of India, attaches an interest to his existence which, it is to be apprehended, will scarcely derive much satisfaction from the accounts of this sage which are recorded. In the first place, a high antiquity must be assigned to him on the authority of the *Rámáyana*, the oldest work, after the *Vedas*, perhaps in the Sanskrit language. His migration to the south is there detailed;† and, disregarding the fabulous motives assigned for his residence there, it seems not a forced conjecture to infer his being a chief agent in diffusing the worship of *Siva* in the Dekhin. Neither this remote date, nor his character as a foreigner, renders it likely that he was the first Tamil teacher; and if we are not allowed to suppose that this character originated in his legendary reputation, we must conclude that the author of the various works attributed to Agastya was a different individual, although of similar name. There are still many works current attri-

* I have already observed the *Pandya-Rájákál* is ascribed to them, apparently erroneously. To Narakira is assigned the tale of *Alakésa*, or king of Alaká, and his four ministers; but the style is unfavourable to its supposed origin,—Tamil works being difficult in proportion to their antiquity, so that the oldest are now unintelligible to ordinary scholars.—Kindersley's Hindù Literature, p. 47.

† In the Aranya Kándam.

buted to Agastya, besides his grammatical aphorisms. These consist of poems in praise of Siva, and a number of medical works.* It is not very probable, however, that the appropriation is generally correct.† At the first institution of the Madura *sangattar*, it would appear that some dispute arose immediately between the professors and the Saiva priests, connected, not impossibly, with that contention for pre-eminence of knowledge which has ever prevailed in the Tamil countries between the Brahman and inferior castes.‡ The priests, however, proved the more powerful; and a reconciliation took place between them and the literati of Madura. At least, we may thus interpret the legend of Narakira incurring the wrathful glance of Siva, and only escaping being burnt to ashes in the flames emanating from the eye in the forehead of the god by plunging into the holy pool Pattamàri, and there composing the Andàdi Pànyam, a poem in honour of Siva. After this event the parties continued upon good terms; and Siva presented to the professors a diamond bench of great critical sagacity, for it extended itself readily for the accommodation of such individuals as were worthy to be upon a level with the sages of the *sangattar*, and resolutely detruded all who pretended to sit upon it without possessing the requisite qualifications. In other words, the learned corporation of Madura resembled learned bodies in other countries, and maintained as strict a monopoly as they possibly could of literary reputation.

The foreign transactions of Vamsa Sek'hara's reign were limited to a war with Vikrama, the Chola prince, who besieged Madura, but was repulsed with the aid of Siva. The son of this prince was more fortunate; and he was engaged in disputes of no more serious a nature than those which were engendered by the rivalry of his literary dependents.

* One of these, the *Agastyar Vaidya Anguru*, is cited by Dr. Ainslie, Preface to the Materia Medica of Hindustan.

† In a manuscript account of Agastya, in the Collection, List, No. 14, thirty-eight works attributed to him are said to be still current. His grammar is, however, said to be lost, in consequence of a curse denounced upon it by Tulagappyam, the disciple of Agastya, according to some legends. In a MS. written by an intelligent native, and already referred to under the title of *Chola Pùrvika Charitra Vyákhyanan*, it is said, that the reputed invention of the Tamil language by Agastya is very improbable, as, in the medical works uniformly ascribed to him, the style indicates a very confined possession of the language; and as to the *Agastyam*, or Grammatical Institutes, said to be lost, there is little reason to suppose it was ever written, as least by Agastya, as he never mentions it, although he states in his *Gnyánam*, or work on theology, that he has written a lack of sentences on theology, an equal number on alchemy, and two lacks on medicine. These inferences are scarcely questionable, as applied to an Agastya of, perhaps, the eighth or ninth century; but the traditions that ascribe the introduction of letters and religion amongst the people of Drávira to an earlier teacher of that name, do not seem to have originated wholly in imagination.

‡ Ellis on the Málayálam Language, p. 26.

From Vamsa Churámani,* we have again a considerable interval without the specification of events as well as names, until the reign of Kuna Pandyan. There are, however, one or two legends which are variously appropriated, and which may, therefore, be employed to fill up the chasm.

The fifteenth prince from Vamsa Churámani is called in the lists Kulása, who was also a patron of literature, and a man of letters himself. This latter character induced him to treat a man of great acquirements, named Yeddakattan, with disrespect. Yeddakattan complained to the deity Sundaréswara, and, withdrawing from Madura to the north of the Vaiki river, was followed by the god, and by the professors of the college. This desertion bringing the king to a sense of his improper conduct, he had recourse to prayer and solicitation, and appeased the offended god, and the more irritable poet; and the temple and college recovered their inmates.

Kulasa was succeeded by his son Arimerddana, celebrated for his illustrious minister Mànikyavàsaka, who was especially instrumental in re-establishing the Saiva worship, and expelling the Bauddhas. The authority of that MS. which appears to be the abridged *Madura Purána*, associates this minister and this king; but the larger work relates the marvels usually narrated of Manikyavasaka, of Tennaven Paramaràya, minister of Vamsa Sek'hara, identifying these two persons. There can be little doubt, however, that Mànikyavàsaka, whether he were a political character at all, was long subsequent to Vamsa Sek'hara; and it is only a question, how much more modern he may be regarded. He is anterior, it appears, to the reformers of Kuna Pandyan's reign, by the testimony of both our authorities and others, of which one places him A. D. 490, and another states his work to have been written above a thousand years ago.† In his life, it is particularly stated that the sectaries he combated were Bauddhas, not Jains, who were the heretics of Kuna Pandyan's reign; and these concurrent considerations warrant the inference, that he may be placed with safety between the fifth and eighth century of the Christian era. We need not detail the marvels recorded of him, as that has been fully and correctly done by a European writer already.‡ His works, which are said to be very difficult, are the *Tiruvásagam* and *Tiruchittambala*-

* With whom the *Pandya Rajakal* closes, as observed above. So does the translation of the *Tiruvaleyadal;* but the original descends to Kuna Pandyan, as does the *Halasya*, filling up the interval, however, with mere names. MS., No. 8, gives the substance of their contents.

† Life of Mánikyavásaka, MSS. No. 15; List of Tamil Authors, MSS, No. 9; Vadur Sthala Máhátmyam; Mackenzie Collection, vol. i. p. 201.

‡ SONNERAT's Voyages.

kavi, poems in praise of the Saiva worship.* The scene of his contest with the Bauddhas was at the temple of Chidambaram, and his opponents chiefly teachers from Ceylon,† the king of which country, it is said, was present at the controversy. The Bauddha disputants, it is asserted, were converted to the orthodox faith, and no persecution appears to have ensued.

Another barren series of names occurs between Arimerddana and Kuna Pandyan, who appears as the twelfth successor of that monarch. According to some traditions, the date of Kuna Pandyan is called 950 of Salivahana, or A. D. 1028;‡ but there are several reasons for supposing this to be erroneous. The *Madura Purana*, and its original, the *Hálásya Máhátmya*, come down to the end of this prince's reign; and they are attributed to the reign of Hari Vira Pandyan, in 973, giving an interval of but twenty-three years for their composition, and for the bold assertion of marvels which it could not be supposed they would venture to advance at a period so close to the realities thus distorted. Either their date, therefore, is erroneous, or that of Kuna Pandyan is incorrect; but there is every reason to suppose they are not much misplaced, as the zeal of the Saiva priests and writers to whom these and other compositions of the same period are evidently to be assigned, was, no doubt, particularly active in and about the ninth century. Again, the chief instrument in the religious revolutions of the Pandya state that occurred in this reign was a Saiva priest, Gnyana Samandar,§ whose works, and those of his first converts and disciples, Appa and Sundar, are well known in the south, and are uniformly referred to the ninth century;|| whence it follows that we must place Kuna Pandyan about that time. The date derives some confirmation from its agreement with the period when the Jain religion, of which Kuna Pandyan was a votary, had grown into credit in the neighbouring regions.¶

Whatever may have been the date of this prince, it appears that prior to his reign two events of some importance had occurred in the

* Account of Tamil Works, No. 9; and List of Tamil Authors, No. 10.

† Life of Mánikyavásaka. ‡ List of Tamil Authors, No. 10.

§ WILKS, on the Authority of a MS. in the Mackenzie Collection, calls him a Pandaram, or Sudra priest of Siva (vol. i, p. 156). This does not appear, however, from any of the MSS. consulted on the present occasion. Gnyána Samandar Charitra, Mackenzie Collection, vol. i. p. 203, App. xix.

|| They are joint authors of the *Tévaram*, hymns in honour of Siva.

¶ The earliest Jaina inscriptions of an authentic character that have been found are those of kings of Humchi, dated Salivahana 804, 819, 820, &c. To them succeed the grants of the Belal kings in the eleventh and twelfth centuries.

Pandya kingdom, which are, not improbably, connected, although the connexion is not adverted to in any of the native accounts. These are the abolition of the *sangattar*, or Madura college, and the establishment of the Samanal religion.

The abolition of the *sangattar* is narrated in the usual marvellous manner.* A candidate for the honour of a seat on the bench of professors, appeared in the person of Tiruvalavar, a pariah priest of Mailapur,† and the author of an ethical poem. The learned professors were highly indignant at his presumption, but, as he was patronised by the raja, they were compelled to give his book at least the trial. For this purpose it was to find a place upon the marvellous bench, which the professors took care to occupy fully. To their astonishment, however, the bench extended itself to receive the work, and the book itself commencing to expand, spread out so as to thrust all other occupants from the bench. The raja and the people of Madura witnessed the scene, and enjoyed the humiliation of the sages; and the professors were so sensible of their disgrace, that, unable to survive it, they issued forth, and all drowned themselves in a neighbouring pool. In consequence the establishment was abandoned.

If we contemplate this event in a literary view alone, we need not be at a loss to understand it. The first professors were eminent in Tamil composition, for the cultivation of which the college appears to have been founded. The members, however, had subsequently, in all probability, directed their attention more to Sanskrit composition, and had, at all events, neglected the cultivation of their native literature. That the latter was the case, is evident from the remark of Avayar, that the old Tamil was preferable to the new;‡ indicating that, even in the ninth century, the dialect had been so far neglected as to have become partially obsolete. With Tiruvalavar, however, circumstances changed. The old system was subverted, and a new impulse was given to the study of Tamil, which produced, in the course of the ninth century, in the Pandya and Chola kingdoms, a number of the most classical writers in the Tamil tongue.§

The date at which the subversion of the college occurred, is another subject of enquiry, and, if we trust to the tradition which connects it with Tiruvalavar, we must identify it with the period of his existence. Other legends make him a brother of *Avayar;* but, as this family

* Account of the Madura Sangattar, vol. 16.

† St. Thomé. Possibly, therefore, something of an attempt to propagate Christianity is here blunderingly and imperfectly narrated.

‡ Asiatic Researches, vol. vii.; Dr. John on the Life and Writings of Avayar.

§ As Gnyana Samandar; Appa and Sundara, above noticed; Avayar herself, and Kamban, the translator of the *Ramayan*.

story is altogether fabulous,* no stress need be laid upon the assertion. The MS. list of Tamil authors states his work to be 1600 years old: and Mr. KINDERSLEY, who has translated a prose version of part of it,† mentions that the original is understood to have been written fourteen hundred years ago. He also notices the extreme difficulty of the style, from which a high antiquity may be inferred; and, from these considerations, we may conclude that the age of Tiruvalavar may have been between the sixth and ninth centuries.

As far as we can judge from the extracts of the *Kadal*, which have been translated, we have some reason to suppose that their author was not a very orthodox member of the Hindu faith. He appears to have advocated moral duties and practical virtues above ceremonial observances and speculative devotion, and so far trespassed upon the strict law. By his allusions to the heaven of Indra, and to various parts of the regular pantheon, as well as the respect he inculcates to Brahmans and ascetics, he does not appear to have been a seceder or a sectary. How far, therefore, he contributed to the introduction of the Jain, or Bauddha faith, into the Madura monarchy, may be doubted, although the diffusion of his doctrines was calculated to undermine the Brahmanical system. At any rate, it is agreed that the kings of Madura had adopted sectarial principles, and that Kuna Pandyan was a follower of the Samanal doctrines, intending by those the Jain faith; although the term will apply also to that of Buddha, with which there is equal reason to identify it.

Some traditions assert that this heresy was introduced from Ceylon. In that case it was the faith of the Bauddhas. The same also aver, that when the heretics were banished they were exiled to that island,—a legend leading to the same conclusion. On the other hand, the expulsion of the Bauddhas from India appears to have been the work of earlier periods, whilst the remaining records of the kings of Húmchi, and the Belal princes, shew that in Mysore the Jain religion was established at this period; and at Madura, the first converts of Gnyana Samandar are usually considered to have been Jaina authors. We may, therefore, consent to call the religion of Kuna Pandyan, Jaina; but the truth seems to be, that neither Jaina nor Bauddha doctrines ever gained an extensive footing in the southern divisions of the peninsula, which have maintained from the earliest to the latest periods an undeviating fidelity to the worship of Siva and the Lingam.‡

* It is detailed at length by Dr. JOHN.

† Extracts from the *Tiruvalavar Kadal*, or *Ocean of Tiruvalavar*.—KINDERSLEY'S Hindu Literature. See also Extracts from the same, or *Tiruvalavar Koral*, by Mr. ELLIS; Mackenzie Collection, vol. i. p. 232.

‡ Some of the traditions of the Jainas assert, that Chamunda Raya, who erected the image of Gomateswara, was minister of Raksha Malla, a king of Madura, in the year of Kali 600. This account is rendered suspicious by the antiquity of the date, even if we

Kuna Pandyan was married to Vani Daswani the daughter of the Chola Raja, who was a devout worshipper of Siva.* She invited Gnyana Samandar, a famous teacher of her sect, to Madura, and an opportunity soon occurred of gaining for him the countenance of the Raja Kuna, who was attacked by a fever which resisted the drugs and spells of his Jaina priests. Gnyana Samandar undertook his cure, engaging to make his success a test of the superiority of his religion. His opponents accepted the challenge; and the medical skill of the Saiva surpassing their expectations, they found themselves vanquished. Attributing the success of Gnyana Samandar to magic, they proposed other tests, to which he readily agreed. Leaves, with the sacred texts of their respective parties were thrown into the Vaiki, under a stipulation that the sect should triumph whose *mantra* floated upwards against the current. The Saiva charm prevailed : it ascended the river to a place called Tiruvedaka, where Siva, in the form of an old man, took it out of the water, and brought it back to Gnyana Samandar. In commemoration of the event, a city was founded on the spot to which the leaf was borne, and a temple was erected by the king to Tiruvedaka Nat'h. The Samanal were persecuted and hanged, or banished, to the number of eight thousand. Kuna Pandyan, who before his conversion was deformed, as his name implies (Kuna meaning "hunch-backed"), no sooner received the initiatory *mantra* of the Saiva faith, than he became erect and straight, and thenceforth assumed the name of Sundara (the "handsome") Pandyan. Gnyana Samandar was established as the chief pontiff of the religious faith which he had restored; and he seems to have instituted a peculiar hierarchy which still subsists, several convents being found in the south of India tenanted by Brahmacharis, or cœnobites, of the Saiva persuasion, whose spiritual head bears the hereditary title of "Gnyani Siva Achari."†

suppose the Kali, or fifth age of the Jainas, to be intended, by which the date will be reduced to about thirty years B. C. Besides, in the published account of this place and image by Colonel Mackenzie, the country of the minister and king is not mentioned (A. R. vol. ix. p. 262), except in a general way, as lying in the south. Chamunda Raya, in another place, is called a king of one of the Chola or Belala races (p. 246). There is nothing in the local traditions of Madura to warrant the assertion. The princes of the name of Malla, it may be observed, reigned in the Carnatic and Mysore in the eleventh and twelfth centuries; and an inscription of a grant by Raksha Malla, printed in the *Asiatic Researches* (vol. ix.), is dated Sal. 1090, or A. D. 1173 (p. 431).

* In an account of the Gopuram of the Bauddha temple at Púdcovaily, this lady is named Mengayakarasi, and called the daughter of Kerikála Chola, who ruled, it is said, A. D. 478.

† Account of the Gnyana Siva Acharis, MSS. No. 17. Colonel Wilks, as observed before, identifies these with the Pandarams, or Jangamas, but this is very questionable. They do not seem to be known as a religious order above the Ghats. In the Carnatic the name has been adopted within the last fifty years, I understand, by a set of Saiva teachers, who officiate as the priests of the blacksmith caste.

The chief and primitive establishment of the order is said to have been founded at Tinnivelly, but it has since been destroyed. It is asserted, that there have been one hundred and thirteen successions of the chiefs of this religious order; a series which would reasonably allow a period of ten or eleven centuries since its first establishment, and so far corroborates the view of Kuna Pandyan's date in the eighth or ninth century of the Christian era.*

The approximation thus made to modern times, is not attended with any great improvement in historical precision. The great outline is clear enough, but the details continue imperfect. In the ninth and tenth centuries, the Chola princes extended their power throughout a great portion of the peninsula, and overshadowed the splendour of the neighbouring kingdom of Pandya. To them succeeded the Belala princes of Mysore, before whose ascendency the ancient honours of Pandya, and the later glories of Chola disappeared. The decline of the Belalas failed to restore the older dynasties to their pristine authority, as, during the period of their depression, the provinces and chieftainships, once attached to these states, had taken advantage of their weakness to assume independence. This disorganised condition of the southern states was perpetuated by the confusion and alarm incident upon the Mohammedan aggressions which began in the fourteenth century, and which were followed close by the extended dominion of the Vijayanagar kings, whose officers finally established themselves, in the beginning of the sixteenth century, in the seat of the Pandya monarchs. Their history has been recorded with something like accuracy and consistency, and sheds a ray of light upon the close of the Madura chronicles. But, before we particularise the events ascribed to these princes, we must advert to the transactions which fill up, however imperfectly, the interval between the reign of Kuna Pandyan and supremacy of the Nayaks of Madura.

According to one authority, which brings down the Pandya history from the earliest to the latest periods,† the first series of monarchs, consisting of seventy-two princes, was followed by another of twelve, with the last of whom, Kodocola Pandyan, the succession of Pandya

* Mons. Langlès (Monumens de l'Hindoustan, vol. i. p. 98), observes of Kuna Pandyan, that his expulsion of the Samaneans must have happened after the middle of the twelfth century. His authority is the History of the Danish Missions; and the grounds of the estimate are not stated. The same work says Kuna Pandyan was the three hundred and fifty-ninth king of a dynasty of three hundred and sixty-two; it seems, therefore, that the compilers of the Danish History, have had no better guides than those we have access to, and that, consequently, no particular weight attaches to their deductions.

† Account of the Pandya Rajas who reigned at Madurapuri, No. 28. See List, No. 1, series 2.

princes of the ancient royal family, ceased. According to the legend, this king unjustly condemned to death a merchant of Congeveram, whom business had brought to Madura. Upon hearing of his fate his wife followed him to that city, where, ascending a funeral pile, she denounced an imprecation upon the place and its sovereign. In consequence of this denunciation, Madura was shortly afterwards almost wholly consumed by fire, and the king and all his family perishing in the flames, the Pandya dynasty was destroyed.

The twelve princes of this list apparently commence with Kuna Pandyan, under his new title of Soma Sundara, and should, therefore, advance to the eleventh century at least; but it may be doubted whether it is very accurately compiled. A distinguished name in Tamil literature is that of a Pandya prince, who is sometimes called Hari Vira, and at other times Adi Vira Pandyan. He is the reputed author of various translations from Sanskrit,* and is said to have flourished in 973 of Salivahana, or A. D. 1041; and his name is not found in the list here referred to, or in any subsequent ones, although there is no great reason to question the correctness of his supposed era. There are, indeed, corroborative proofs of its accuracy. A history of the kings of Konga, after that country had become subject to the Chola princes, gives an account of a war between Vira Pandyan and Divya Raya, in which the former was defeated and taken, and had his ears cut off. And in the next reign, the Chola army advanced to Madura and took the city, the Pandya prince saving himself by flight. He was restored subsequently by the Chola monarch, on account of the relationship subsisting between them, but appears thenceforward as a subordinate and tributary prince. These events are placed by the Konga history† in the end of the tenth century, which is as near to the traditionary accounts of Hari Vira's date as we can well expect. Perhaps it is not very unreasonable to connect the tradition above cited of the conflagration of Madura, with the account of its capture in the Konga history, and to infer that they both relate to the same events; or the occupation and partial destruction of the capital, and temporary subversion of the state by foreign invasion, in the beginning of the eleventh century.

The history of the kings of Pandya relates, that the overthrow of the dynasty was succeeded by an interval of anarchy, the duration of which is not specified. At the close of the period the throne was taken possession of by an adventurer, the son of a Brahman by a dancing girl, and a native of Kolam, near Madura, who assumed the name of

* The Kasi Khanda of the Skanda Purana, the Kurma and Linga Puranas, and the Naishadha.—*List of Tamil Authors.*

† Konga Desa Raja Cheritram, translated from the Tamil, 18.

Chandra Kula Dwipa.* He was succeeded by fourteen princes, in the reign of the last of whom the province of Madura was first assailed by the Musalman arms; an occurrence which enables us to form some estimate of the dates of preceding transactions.

The first Mohammedan invasion of the Dekhin occurred in the reign of Alla-ad-din in 1293. The first army that crossed the Krishna† was led by Kafur, or Malek Naib, in 1310-11; and, as he carried his conquests to Rameswar, the work cited may possibly refer to this incursion. According to another authority, the event was dated in 1325, which is sufficiently near, unless, which is not improbable, the allusion blends the first and second invasion together, in which last Mujahid Shah,‡ in 1374, overran the countries between Vijayanagar and Cape Comorin, and advanced to Rameswar. In either case we have a period of less than three centuries assigned to fifteen princes, which would leave no very disproportionate average for their reigns, except that, as the whole season was one of tumult and disorder, and as the rulers were usurpers and intruders, they must claim considerably less than the average duration which might be assigned them in tranquil times, and under long prescriptive sway.

Any deduction to be made from the average duration of the reigns in question, may partly be filled up by the period of anarchy which succeeded the destruction of Madura. How long this continued does not appear; nor, indeed, can its existence to the full extent of the authority here followed be admitted. The sovereign of Madura, deposed by the Chola prince, was subsequently restored by him; and in the inscriptions of the Belala race, in the eleventh and twelfth centuries, it is said, they made the kings of Madura their tributaries.§ It is probable, therefore, that legitimate princes of the ancient house continued to sit on the throne of Madura, some time after the capture or conflagration of their capital, till, weakened by foreign aggression and domestic disobedience, they finally yielded to the enterprise of an adventurer, and the establishment of a new dynasty.||

* List, No, 1, series 3.

† SCOTT's History of the Dekhin, Introduction, p. xiii, ‡ Ibid. vol. i. p. 42,

§ As late as the reign of Vira Narasimha (1149 to 1172).

|| Toward the end of the thirteenth century, MARCO POLO calls the king of that part of the peninsula opposite to Ceylon, and the site of the pearl fishery, Sender Bandi. Il (Re) principale che é capo della provincia si chiama Sender Bandi, nel suo regno si pescano le perle. MARSDEN conjectures Chandra Bandi may be understood to signify the "slave or servant of the moon," 627, note 1257; but the Madura records furnish us with a much more obvious derivation. The king Sender Bandi may possibly be the Chandra Pandi, or Pandya of the text. If this is not thought satisfactory, it may be a slight corruption of the hereditary title of the prince of Marwar, in whose boundaries the pearl fishery lies, and who has been for a long period past entitled the Sétu Pati, or Lord of the Bridge; the ridge of rocks between Rameswar and Manar.

The invasion of the Musalmans was attended with the downfal of the usurping dynasty; and, after a short interregnum, a prince, descended from the ancient rajas, was placed upon the throne with the assistance of the Canara people, it is said; but, probably, the Raya of Vijayanagar is intended, to whom, at an early period of that empire, or shortly after the middle of the fourteenth century,* the Pandya kingdom probably became tributary. The prince placed upon the throne was named Soma Sek'hara, and he was followed by a series of seventeen princes to Chandra Kumara Pandyan, when an officer of Krishna Ray established the line of Telinga princes, generally termed the Naiks (Nayakas) of Madura, and abolished the shadow of authority retained by the Madura kings over a portion of the ancient kingdom, now restricted almost to the boundaries of the capital.

Besides the earlier encroachments made on the east and north by the Tanjore princes, and on the west by the Belal rajas, the interval that elapsed between the Musalman invasion, and the establishment of the Vijayanagar Nayakas on the throne of Madura, had witnessed the separation of the southern provinces from the ancient dominion of the Pandya kings; and, particularly on the eastern coast, the extensive districts of Ramnad and Marawa, became, and ever afterwards continued, independent of the Pandya sovereignty, of which, for many ages, they had formed important divisions.

After the establishment of the chiefs of Marawa or Ramnad, as independent princes, adulatory ingenuity was employed to devise for them an honourable origin. The founder of the family was accordingly made contemporary with Rama, who having, after his conquest of Lanka, erected a *linga* on the small island opposite Manar, which was thence denominated Rameswar, consigned the hereditary charge of the deity and temple, and superintendence of the pilgrimage, to the Adi Setu Pati, or first lord of the causeway.† The effort to aggrandise the ruling family here ceased; and, during an uncertain and protracted interval, the supposed descendants of this chief continued, it is ad-

* One account (Sketch of Madura History, No. 19) says, the country was governed from 1370 to 1402 by Mysore viceroys, when two chiefs, named Ellakana and Mathuna, held it till 1448; then resigning it to a prince of the old dynasty. That the Mysore or Belala princes exercised a supremacy over Pandya, is unquestionable, but it must have been earlier than the period here mentioned, as by the first date (1370) the Belala power had been overturned. The authority exercised by them aud the Vijayanagar kings, too, did not, probably, involve the removal of the native princes; and this probability is converted into certainty, as far as affects the latter, by the appearance of inscriptions in the name of Vira Pandyan, one of which is dated 1402 Sal., in the fifth year of his reign, and a subsequent one in the fifteenth, or Sal. 1412 (A. D. 1490); a short time, therefore, before the final eradication of his family.

† General History of the Kings of Ramnad, or the Setu Pati Samasthanam, 20; Memoir of the Setu Pati, 21.

mitted, dependents and servants of the Pandya monarchy. A few years after the irruption of Mujahid Shah, or about 1380, the governor of Ramnad threw off his dependence on Madura; and his successors extended their authority to the neighbouring provinces, since called the Great and Little Marawas. Family dissensions, fostered by the Nayakas of Madura, or Tanjore, subsequently divided these districts into separate chieftainships; and the aggression of their neighbours, as well as their domestic feuds, prevented the power of the Setu Pati from ever acquiring a permanent or consolidated form. The Telinga princes of Madura, and the Mahratta rulers of Tanjore, claimed, and occasionally exercised, the supreme authority; and latterly, the Nawabs of the Carnatic assumed a sway which in general was little more than nominal. Finally, the Madras presidency collected the tribute of the two Marawas from the year 1792, and in 1801, by treaty with the Nawab of Arcot, obtained the complete sovereignty.*

The Setu Pati was not the only prince who, in this distracted state of the kingdom committed encroachments on its territorial possessions; and even the adjacent province of Tinnivelly was detached from its connexion with Madura, under the administration of the Nayaks. This dependency was, however, recovered; but it subsequently was occupied by an independent Poligar, till the Nawab of the Carnatic extended the pretensions of his authority over this part of the peninsula, which, along with the rest of his rights, were converted into substantial possession by the British government. Besides Ramnad and Tinnivelly, a variety of petty chieftains assumed independence; and, upon the occupation of Madura by the first Nayak, five Rajas are said to have combined to revenge the wrongs of the ancient dynasty of Madura. These petty chiefs were the ancestors of some of the Poligars of the south, who gave so much trouble to the British forces in the middle of the last century. Others originated with grants made by Viswanath Nayaka, about the middle of the sixteenth century, to the rebel leaders who had co-operated with the Vijayanagar arms in the final overthrow of the Madura monarchy.† Of these petty chiefs living by plunder and violence, the native lists enumerate seventy-two in the Tinnivelly and Trichanapali districts. Their numbers must, of course, have been subject to perpetual fluctuation, and increased or diminished with the absence or existence of any one preponderating power amongst them. The nature of their habitations, in the bosom of unhealthy and almost inaccessible wilds, gave, however, a certain security to their existence; and the efficiency of the native government was never such as to accomplish their suppression. Through a period of three centuries,

* Hamilton, vol. ii. p. 473.

† Mutiah's History of the Nayakas of Madura, 22.

therefore, the southern portion of the peninsula was parcelled out amongst a number of petty chiefs, scarcely to be dignified even as commanders of banditti ;* their predatory followers preferring a system of insidious pilfering to open plunder, and rarely venturing, without decided superiority of number or position, to face an enemy in the field. Too indolent to till the soil, too insecure to desire fixed property, they lived by hunting and robbery, and were, therefore, but little disposed to check the luxuriance of rank vegetation, which yielded them at once subsistence and shelter. It is not surprising, therefore, that the countries which the Poligars occupied should have been overrun with inhospitable and noxious forests ; and, it may be concluded, that had not a wise and powerful policy interfered to enforce the habits of social life, the fine districts to the south of the Kaveri, most admirably fitted by nature to support an industrious population, would have reverted to the state in which tradition describes them long anterior to Christianity, and would once more have become a suitable domicile for none but the goblins of Ravana, or the apes of Hanuman.

The princes of Vijayanagar had established their supremacy over most of the countries south of the Krishna river before the sixteenth century, but they appear in general to have left the native princes in

* The state of the countries, and the characters of their Collaries and their other inhabitants, are well described in ORME'S History ; and their unaltered condition, at a period a little subsequent, is concisely and clearly described by FULLARTON. The extent and dreary aspect of the thickets, as well as the ferocious manners of the people, are also the subject of frequent and interesting description by the members of the Catholic missions, which were sent to this part of India between the end of the seventeenth and the middle of the eighteenth century. See Lettres Edifiantes et Curieuses, vols. x. to xv. The Collars have several peculiar customs contrary to those of the Hindus, particularly the frequency of remarrying allowed to the women, either upon voluntary separation from their husbands, or their death. This custom exists with very few exceptions (MS. Accounts of the Collaries, 25, 26). The pre-eminent power and stability of the *tondiman*, as the principal Poligar chief is called, has introduced a bias to Hindu habits ; and his wives having sometimes been known to sacrifice themselves on the funeral pile, the fashion has gained ground in his dominions. The Collars are chiefly worshippers of Siva and Kali. They are not very rigid in their diet, drinking spirits and eating flesh and fish. The lax observance of the Hindu practices, which prevailed formerly amongst these tribes to a greater extent than at present, may partly furnish a reason to believe that the extensive proselytism effected by the Madura missionaries in these districts was not altogether a fiction. It appears, indeed, that amongst the thirty thousand Christians under the Madura mission, was included a considerable portion of the *calaris*, or thieves. "Je me mis sous la conduite de ce guide qui me fit bientôt quitter le grand chemin pour entrer dans le pays de la *caste des voleurs.* On la nomme ainsi parce que ceux qui la composent faisoient autrefois metier de voler sur les grands chemins. *Quoique la plupart de ces gens-la se soient faits Chretiens,* et qu'ils ayent aujourd'hui horreur de l'ombre même du vol. ils ne laissent pas de retenir leur ancien nom, et les voyageurs n'osent encore passer par leurs forêts. Les premiers missionaires de Maduré furent *assez heureux de gagner l'estime de cette caste* de sorte qu'à present il n'y a guerès de lieu, ou nous soyons mieux reçus et plus en suretè que dans leurs bois."—Du Pére MARTIN au Pére le GOVIEN, Decembre 1700, vol. x. p. 160.

possession of their local sovereignties, and to have contented themselves with enforcing an acknowledgment of their paramount dignity, and exacting in times of emergency pecuniary and military aid. Such was the case with the Pandya and Chola kingdoms, which were governed in the reign of Krishna Raya of Vijayanagar by their own kings. A war broke out between Vira Sek'hara, the Chola, and Chandra Sek'hara, or Chandra Kumara, the Pandya prince, in which the Madura monarch being worsted, he was compelled to fly his country, and, in this distress, had recourse to Krishna Raya for protection and assistance. An opportunity of this nature was not likely to be disregarded by the Vijayanagar court, and Nagama Nayaka, overseer of the royal cattle, was despatched with a considerable force to reinstate the Madura prince, and punish the ambitious presumption of the sovereign of Tanjore. The task was easily effected; and Chandra Sek'hara seated on the throne of his ancestors. His restoration, however, was but nominal, as Nagama Nayaka retained the sovereign authority in his own hands, keeping the king of Madura in confinement, and disregarding the commands and menaces even of Krishna Raya, who found his successful general converted into a rebel.

The valour and conduct of Nagama Nayaka rendering the officers of Vijayanagar reluctant to undertake his chastisement, he seemed likely to maintain his newly acquired authority in perfect impunity.* To the surprise of the Vijayanagar court, however, an antagonist to Nagama was found in the person of his only son, Viswanath ; a son whom he had performed a pilgrimage to Benares to obtain, and whom he had left for education, or who had not improbably been detained as a hostage, at Vijayanagar. As Viswanath Nayak had given many proofs of his military talents, and as his professions of loyalty were credited, he was accordingly intrusted with the unnatural duty of revenging his prince upon a father, and marched with a strong force against Nagama. The father was defeated and taken prisoner, and, according to one account, delivered to Krishna Raya by Viswanath, who replaced the legitimate king of Madura on the throne, and returned triumphantly to Vijayanagar, where, in consideration of the merits of the son, the

* The materials for the history of the Nayaks of Madura, although not very full, are, as far as they extend, satisfactory. They are, 1. A History of the Modern Kings of Madura, by TRIUVERCADU MUTIAH, an ingenious native of the Carnatic, an amusing account of whose studies, written by himself, is published in the *Asiatic Annual Register*, for 1801 ; 2. A History of the Telugu Rulers of Madura, translated by Mr. WHEATLEY from the Tamil ; and, 3. A Sketch of the History of Madura, to the reign of Trimal Nayak, Nos. 19, 22, 23. A fourth account (24) is confined to the affairs of the descendants of Vijaya Ranga Choka Nat'h, who died in 1731. It is drawn up by the representative of the family, Vijaya Kumara Viswanath Bhangaru Trimala Nayak, the great grandson of the last Nayak of Madura.

father was forgiven. The king of Madura soon after dying, and leaving no heir, Viswanath Nayak was installed by the sovereign of Vijayanagar as feudatory prince of Madura. Another history of Madura, however, omits these circumstances, and describes Viswanath as the officer sent to the assistance of the Pandya prince, and the usurper of the independent sovereignty. At any rate, it is evident from the tenor of both accounts that Viswanath Nayak first established this dynasty, and that his assumption of the regal authority was acquiesced in by the court of Vijayanagar, too much occupied in watching the proceedings of their new neighbours of Bijapur* to attend to the affairs of the more southern districts.

After the inauguration of Viswanath Nayak, he proceeded to strengthen himself in his new government; and, with this view, having enforced the cession of Trichanapali from the Chola Raja, he improved the fortifications of that stronghold, and built a palace in the fort for his reception. He then directed his attention to the settlement of Tinnivelly and the southern districts, the depopulated parts of which he distributed amongst his adherents, chiefs of the Totia caste, to the number of seventy-two, who were the progenitors of the petty chiefs subsequently known as Poligars. This measure, however, and resentment for the extirpation of the ancient royal family, seem to have aroused the remaining chiefs of that principality to arms, and a force, led by five rajas connected with the Pandya dynasty, opposed the further progress of Viswanath. The quarrel was, however, decided by the personal conflict of that chief with Agra Pandyan, who was selected as the champion of the enemy, and was killed in the combat. According to one of our histories, Viswanath survived his victory but a short period, dying of his wounds on the ensuing day. According to another account, he recovered, and continued to reign long enough to extend and consolidate his power.†

* Established as an independent state in 1489 by Yusuf Adil Khan.—Scott, vol. i. p. 207.

† Although the two histories agree in the main facts, they differ considerably in the details, and especially in the chronology. Mutiah's account places Viswanath's accession, A. D. 1560, the other, A. D. 1431. The former of these best agrees with Krishna Raya's date, and with the previous history of Madura: it may be about forty years too modern. Mutiah's history enumerates but eleven princes between 1560 and 1742, or one hundred and eighty-two years; the other names fourteen princes in three hundred and seven years,—the former giving about seventeen, the latter twenty-two years to a reign. But this proportion is too much, as three of the fourteen princes are three brothers who reigned consecutively, and the average of whose reigns could not, therefore, have exceeded half this number. We shall have a more probable result, if we suppose the number of princes to be, including Nagama, fifteen, and the number of years two hundred and twenty-two, from 1520 (for Krishna Raya, ruled from 1509 to 1530) to 1742, which will give us something less than fifteen years to a reign. Colonel Wilks says, the dynasty of the Nayaks of Madura was founded

The second prince of Madura, Peria Krishnapa Nayak, the son of Viswanath, succeeded his father. He extended the authority of the new family towards the south, reducing to subjection the Poligar of Permagúdi: he enlarged and beautified Tinnivelly, and built a village to the south of Palamcota, called after his own name Kistnapuram. And here, as well as near Tinnivelly, he built a temple of Siva, and a range of dwellings for the residence of Brahmans, attaching to both liberal endowments.

The third prince of this race was the son of the preceding, Peria Virapa Nayak, who emulated his father in extending the authority of Madura, and in founding temples and endowing religious establishments.

The succession of the Nayaks is here differently stated, Mutiah's History passing to a second Krishnapa Nayak, calling him the son of the last prince, whilst the other account states that Peria Virapa Nayak left three sons, Viswapa, Kumara Krishnapa, and Kasturi Rangapa, all of whom succeeded in regular order to the government. The last was succeeded by Krishnapa, who was the son of the second brother, Kumara Krishnapa, and until whose reign no particular transactions have been thought worthy of being recorded.

The most remarkable incident of this reign was the formal acknowledgment of the Poligar of Ramnad, as the sovereign of the eastern coast. This event must have taken place at the end of the sixteenth century; and the accounts of Marawa assert the independency of the founder of the sovereignty about two centuries sooner. They agree, however, with the histories of Madura, in admitting, that about this period, Wodeya Deva was recognised by the king of Madura as the legitimate ruler of Ramnad, and warden of Rameswar; and there can be little doubt, therefore, that the power of the Marawa rulers first assumed a consistent form at the period here described. They were not, however, entirely independent, as, although authorised to extend their authority over their refractory and predatory neighbours, they were required to pay tribute to the Madura government; and they were especially enjoined to give protection to the pilgrims to Rameswar against the Colars and Marawars, who had been accustomed to plunder and harass these devotees upon their passage, so as almost to have deterred the people of other parts of India from undertaking so perilous a journey.

by Nagana Naid (or Naik) about 1532, in the reign of Achyuta Deva, with the aid of a colony of Telingas, which seems to have been planted in the country some time before by the government of Vijayanagar. The descendants of those are the Poligars of the present day, who are undoubtedly of Telinga, not Tamil, origin (vol. i. p. 54, note). Their introduction is differently stated in the authorities followed in the text.

Virapa Nayak succeeded his father. According to one account, Trichanapali was first attached to the government of Madura in his reign, having previously belonged to the state of Tanjore, from which it was obtained by exchange, the fort of Vellam being ceded to that state in lieu of this citadel. The transaction is uniformly so described; but it is referred by other authorities to the reign of Viswanath, the first Nayak, as already noticed, or to that of Tirumalla Nayak, the successor of Virapa.

The accession of Tirumalla Nayak, the son and successor of the last prince, brings us to a period of chronological certainty, and is placed by the different authorities within two or three years of the same date, or 1621, 1623, and 1626. The reign of this prince was long and flourishing, and the public edifices erected during his sovereignty still furnish splendid proofs of his wealth and magnificence.

The affairs of Ramnad form the most important transactions of this reign. Kutan Setupati, the son of Wodeya Deva, who had succeeded his father, left, upon his death, four legitimate sons, and one illegitimate. Of the first, the third son succeeded his father, but the fourth, Adi Narayan, disputed his possession of the country, and, with the assistance of his son-in-law, Tiruvadeya-vanni, a man of great military enterprise and ability, appears to have deposed his brother, and made himself master of Ramnad. The illegitimate son of Kutan, named Tumbi, had recourse to the court of Madura, and easily prevailed upon Tirumalla Nayak to send an army under his general, Ramapya, to put him in possession of what he claimed as his inheritance, a portion of the Marawa principality. Whilst Tiruvadeya-vanni lived, the troops of Madura were successfully resisted; but, upon his dying of the small-pox, a casualty ascribed to the incantations of his enemies, Ramapya overran the country, and taking Adi Narayan prisoner, carried him to Madura, where he was detained in close confinement.

Tumbi Setu Pati was now sole master of Ramnad, but the people contemning the baseness of his birth, withheld obedience to his orders, and, breaking out into open rebellion, he was glad to seek safety again in the court of his patron. The eastern districts were now without a ruler, and the same dangers that formerly prevailed once more obstructing the pilgrimage to Rameswar, the Brahmans and religious mendicants solicited the restoration of Adi Narayan to the government, as calculated to re-establish order and security in the country. Tirumalla complied in some degree with their request; but, acting upon a maxim which has constantly influenced eastern politics, as well as those of more civilised regions, he gave to Adi Narayan, with his liberty, but a third part of his patrimony, leaving another

third in the hands of Tumbi, and conferring the rest on Danu Kanta, the son-in-law of Adi Narayan.

This division of the Marawas, although it laid the foundation of future partitions, did not at that time long continue. Tumbi contrived to put his brother to death, but soon after dying himself, his portion was seized by Vijaya Raghunath, the adopted son of Adi Narayan, who, likewise, gained possession of the state of Danu Kanta upon his death, and thus re-united the three governments under one head. This prince, although he extended his authority over the adjoining districts, continued obedient to the authority of Tirumalla; and, upon the invasion of Madura by a formidable army from Mysore, was highly instrumental in their repulse, leading, with an activity which received the acknowledgment of the Nayak, a considerable force to the assistance of his lord paramount, and mainly enabling him to defeat and expel the invaders.

Although the fortress of Trichanapali was the chief stronghold of the kingdom of Madura, the city of Madura appears to have been the favourite residence of Tirumalla Nayak. We have already ascribed to a much older prince the original construction of the fort, the temple, and palace, of which such stately vestiges still exist. There is no doubt, however, that they owe much of their present form to the taste of Tirumalla Nayak, and the palace of Madura especially shews indications of modern architecture; at the same time, the more celebrated building, still in good order, the Choltri of Tirumalla Nayak, known to be his work, is an edifice purely Hindu, and blends the square and massive character of the general structure with the singularly minute decoration, and luxuriantly fantastic development of the details. The Choltri is a chamber of an oblong square form, the flat roof of which of long stones, rests upon one hundred and twenty-four pillars of stone twenty feet high, and placed in four rows. The pillars are curiously carved with different figures representing stories connected with the Hindu religion, the peculiar legends of the *Madura Purana*, and the persons of the founder, and his predecessors. One pillar represents Tirumalla Nayak himself, with six of his wives, and a number of the women of his haram. The Choltri, it was said, was begun in the year 1623, the second year of the founder's reign, was finished in twenty-two years, and cost above a million sterling. It was built, it is asserted, to receive the Lingam of the great temple ten days in every year, the Brahmans agreeing to bring their divinity forth upon condition of Tirumalla Nayak's providing a suitable place for his temporary accommodation. Besides this Choltri, the same prince is said to have completed three other great works—a pagoda; a tank, three quarters of a mile square, twenty feet deep, and faced with stone; and a grand palace or-

namented with black granite pillars, some of which are twenty feet high cut out of one stone.*

The reign of Tirumalla Nayak was of considerable duration; one account says forty years; another, thirty-six; and the lowest computation, therefore, brings it to the year 1657,† when he was succeeded by his son Virapa, a prince of an effeminate and indolent disposition, and who, accordingly, was unable to repress the incursions of the Mysoreans, under so active a prince as Kanti Deva Nana Raj. They took several places in the western districts during this reign from the Madura Nayak.‡

Chokanath Nayak succeeded his father; he was a prince of some conduct and enterprise, and rendered himself formidable to all his neighbours. He first turned his arms against Vijaya Raghava, king of Tanjore, whom he defeated and put to death, taking prisoner his ally, Surya Deva, the Setupati, and assisting Kilavan, the cousin of the captive prince, to become master of Ramnad. He then invaded the kingdom of Mysore, expecting to reduce it under his authority, but the events of the war reversed his expectations, and inflicted severe losses on the government of Madura.

The son of the late king of Tanjore, Chengamal Das, had made his escape from the fort of Trichanapali, where he had been confined. His escape was effected probably with the aid of Rustam Khan, a Mohammedan chief, who had been a favourite of Chokanath, and who commanded the garrison under the orders of Mudala Rudra Nayak, the brother of Chokanath, an extravagant and indolent prince, who lavished on his personal gratifications the sums destined for the pay of the troops. Taking advantage of their discontent, Rustam Khan liberated himself from all controul, and made himself master of Trichanapali. This event, with the escape of Chengamal Das, encouraged the Raja of Chenji to advance to Srirangam, whilst the raja of Mysore on that side now became the aggressor. In this state, Chokanath found some difficulty in preserving the shadow of his former power, and his enemies retained the superiority for a considerable period, the Mysoreans oc-

* BLACKADER's Account of the Buildings at Madura, Archæologia, vol. x. Views of the Choltri, &c. have been given by DANIEL, and LANGLES' Monuméns de L'Hindoustan.

† It must have been in the early part of this reign that the Portuguese Jesuits, under ROBERT DE NOBILIBUS, established the Madura mission, although a liberal benefactor to the Brahmans; therefore, Tirumalla Nayak could not have been a bigot. There were two Christian churches in the city of Madura.—*Lettres Edifiante*, xiii. 130.

‡ As Denaikan-cotta, Satyamangal, and other ta'alluks.—WILKS, i. 54. These aggressions are dated 1653 in the History of Mysore, but, as it is said, they were taken from Virapa, Naik of Madura; and, as the character of this prince renders such an event probable, it is most likely that Colonel WILKS's date is a few years erroneous.

cupying even the capital, Madura, it is said, for three years.* It was probably to purchase their retreat that Chokanath ceded to Mysore the districts of Errur and Darapur.† Having thus got rid of one of his most powerful enemies, and being vigourously reinforced by Kilavan Setupati, he next dispersed the troops of Chengamal Das, and re-occupied Tanjore. He finally recovered Trichanapali from Rustam Khan, who lost his life in the defence; and the Chenji Raja retreating to his own capital, Chokanath remained in the tranquil possession of his patrimonial possessions. He soon, however, lost his acquisitions in Tanjore, the fugitive prince, Chengamal Das, having recourse to the Mahratta chief, Ekaji, for assistance. That adventurer, who commanded at Bangalore, under the nominal authority of the Mohammedan court of Bijapur, readily undertook his protection.‡ The confederates marched to Tanjore, and soon expelled the forces of Madura. The Mahratta, presently usurping the sovereignty of Tanjore, was not at leisure to prosecute his success against Chokanath; and these princes very shortly afterwards entered into a mutual confederacy to oppose the incursions of Sevaji.§ These events, which are usually placed between 1675 and 1680, are in perfect conformity with the period of the reign of Choka Nayak as stated in the authorities we have followed, and which date its termination in 1685 or 1687.

Chokanath Nayak was succeeded by his son, Ranga Krishna Muto Virapa, who died young, after a reign of seven or eight years, leaving his wife pregnant with a son, afterwards named Vijaya Ranga Chokanath Nayak. During his minority the regency was exercised by Mangamal, the grandmother of the prince, a woman of great talents and manly spirit. One account describes her as preserving her authority until 1712, but another|| states, that when the prince was thirteen years of age, the commander of the forces, Kasturi Ranjya, excited an opposition to her which ended in his seizing the reins of government, and in her confinement until her death, which speedily followed. We know, however, that in 1700, she was regarded as the ruler of Madura for her grandson,

* MUTIAH's History. The fact is confirmed by the *Lettres Edifiantes*. One, dated 1719, observes of the Christian churches at Madura,—Ces Eglises furent tout à fait renversés lorsque la ville fut prise et ruinée en partie par le Roi de Mayssur. Vol. xiii. p. 131.

† WILKS, i. 58.

‡ This is rather differently narrated in the Pratapa Vamsavali Bhosla. There it is said the prince of Trichanapali applied to Shahoji for assistance against Vijaya Raghava, prince of Tanjore. That Shahoji enabled the Raja of Trichanapali to repel his enemy and capture Tanjore, but that he then appropriated the conquest to himself, expelling his ally from the country, and leaving it under the administration of his son, Eekaji.

§ WILKS, i. 78.

|| MUTIAH's History.

although the administration of the affairs of the state was in the hands of a governor, or regent, who exercised unlimited authority.*

The reign of Vijaya Ranga Chokanath Nayak was not distinguished by any remarkable event. He died in 1731,† leaving no child; he was, therefore, succeeded by his wife, Minakshi Amman, who adopted Vijaya Kumara, the son of Bhangaru Trimal Nayak, a descendant in a direct line from a younger son of Tirumalla Nayak. This adoption was enforced by the law of the country, so that Minakshi Amman was in fact only regent during Vijaya Kumara's minority. The adoption was generally acceded to by the ministers and men in authority, but it was disputed by Bhangaru Tirumalla Nayak, the father of the youth: he claimed the inheritance to the throne, and his claims were powerfully supported by the activity and influence of his years and rank. The parties are described in one account as having come to an indecisive engagement; but it is admitted that the matter was, with much less policy, referred to the Nawab of Arcot, who sent his son, Sufdar Ali, and Chanda Sahib, with an army to hear and decide the disputed question. The cause was discussed at Trichanapali, and the general bias leaning to Bhangaru Tirumalla Nayak, he was placed on the throne, presenting three lacks of rupees to his Mohammedan friends, and acknowledging himself the tributary of the Nawab of Arcot.

The same means that had secured a favourable award for the successful candidate, were now employed to procure a reversion of the sentence, and a nazzer of a crore of rupees, it is said, prevailed on Chanda Sahib to undertake the cause of the Rani. These negociations becoming known to Bhangaru Nayak, he quitted Trichanapali, and endeavoured to secure himself in Madura and Tinnivelly, but he was unequal to oppose the troops of the princess, aided by the Mohammedan arms, and, after a few unsuccessful skirmishes, he fled to Sivaganga, where the ruling Setupati, Katta Deva, received him and assigned him some lands for his subsistence. The zeal which Chanda Sahib had displayed in behalf of Minakshi Amman, and the success with which it had been attended were calculated to inspire confidence as well as gratitude; and it was under these impressions that the princess granted free access to the citadel of Trichanapali to her defen-

* " Cette Princesse Mangamal, qui est comme depositaire de la couronne, fait élever avec un grand soin son petit fils, prince agé de quatorze ou quinze ans, à qui le royaume appartient, et confie, cependant, tout le gouvernement de l'état au Talavay, ou Prince Regent."—*Lettres Edifiantes*, x. 171. The letter is dated Avour, in the kingdom of Madura, 11 Dec. 1700.

† Mutiah says 1734, Orme (1, 38), 1736; but our date is confirmed by MSS. 24, which, as a family account of such recent events, seems to be the best authority.

ders. The further precaution, however, was taken, of exacting an oath from Chanda Sahib, that he would not avail himself of this facility to the detriment of his ally. No obstacle, however, was likely to deter this ambitious prince from securing a post of such importance to his meditated schemes of aggrandisement; and, consequently, in despite of oaths and protestations, he presently seized upon the citadel of Trichanapali, and threw Minakshi Amman into prison, in which the queen, overcome by shame and despair, swallowed poison and died, thus terminating the series of the Hindú sovereigns of the Pandya kingdom. Bhangaru, with his son, the cause of these dissensions, continued some time under the protection of the Sivaganga Poligar. They and their descendants were from time to time encouraged by the Nawabs of the Carnatic to expect their restoration to the possessions of their ancestors, but there is no reason to suppose such hopes were ever held out to them in the spirit of sincerity, and it is certain that they bore no fruit. The family remained some time at Vellikurchi, afterwards at Ramnad, and were thence obliged to take refuge amongst the Poligars. After the war with Tipú they returned to Vellikurchi, where they have continued to reside.

It is unnecessary to follow further the history of Madura, as it becomes, from this period, a portion of that of the British empire in India.

LISTS OF THE PANDYAN KINGS.

	No. 1. Vamsavali, Vol.	No. 2. Vol.	No. 3. Madura Purana, Vol.	No. 4. Madura Purana, Vol.	No. 5. Halasya.
1	Kulasek'hara	Kulasek'hara		Kulasek'hara	Kulasek'hara
2	Malaya Dhwaja	Malaya Dhwaja		Malaya Dhwaja	Malaya Dhwaja
3	Sundara	Minakshi and Sundara	Soma Sundara	Sundara	Sundara
4	Vira	Wugra	Wugra	Vugra	Wugra
5	Abhisheka	Vira	Vira	Vira	Avhisheka Vira
6	Vikrama	Abhisheka	Abhisheka	Abhisheka	Vikrama
7	Rajasek'hara	Vikrama	Vikrama	Vikrama	Sek'hara
8	Anantaguna	R. Sek'hara	R. Sek'hara	R. Sek'hara	Kulottunga
9	Kulabhara	Kulottunga	Kulottunga	Kulottunga	Anantaguna
10	Varaguna[2]	Anantaguna	Anantaguna	Anantaguna	Kulabhushana
11	Raja Raja	Bhushana	Kulabhushana	Kulabhushana	Rajendra
12	Raja Gambhíra[5]	Rajendra [hara	Rajendra[4]	Rajendra	Rajesa
13	Chitra Virta	Sundareswara Pada Sek'-	Tari Raja	Rajesa	R. Gambhira
14	Chitra Guna	Varaguna	Udalura	R. Gambhira[5]	P. Vamsapradi-paka[5]
15	Chitra Dhwaja	Raja Raja	Gambhira	P. Vamsadipa	Puruhutajit
16	Chitra Guna	Vamsa Sek'hara[3]	Vengi Adi	Purandarjit	P. Vamsa Pataka
17	Chitra Vikrama	Vamsa Churamani	Purandara	P. Vamsa Vataka	Sundarapada
18	Raja Martanda	Kula Sek'hara	Kumara	Sundaresa Pada Sek'hara	Varaguna
19	Raja Chudamani	Arimerddhana	Vangeya	Varaguna	Raja Raja
20	Raja Sundara	Chokanath	Eradana	Raja Raja	Chitra Ratha
21	Raja Kulottunga	Virabhadra	Sundaresa Pada Sek'hara	Suguna	Chitra Bhushana
22	Raja Sirogicha Gambhira	Vira	Varaguna	Chitra Viratha	Chitra Dhwaja
23	Raja Gambhira	Prakrama	Raja Raja	Chitra Bhushana	Chitra Verma
24	Pandya Vansa Dipa	Suravhi	Suguna	Chitra Dhwaja	Chitra Sena
25	Purandara Sundara	Kunkuma	Chitra Ratha	Chitra Verma	Chitra Vikrama
26	Pandya Vamsa Dhuran-	Karpura	Chitra Bhushana	Chitra Sena	R. Martanda
27	Jannadeswara [dara	Karunya	Chitra Dhwaja	Chitra Vikrama	R. Churamani

	No. 1. Vamsavali, Vol.	No. 2. Vol.	No. 3. Madura Purana, Vol.	No. 4. Madura Purana, Vol.	No. 5. Halasya.
28	Pandu Sek'hara	Puruskottama	Chitra Verma	Raja Martanda	R. Sardula
29	Varaguna	Chatursasana	Chitra Chera	Raja Churamani	R. Kulottama
30	Raja Sardula	Kuna, or Sundara	Chitra Vikrama	Raja Sardula	Ayodhana Pravina
31	Raja Kulottama		Raja Martanda	Raja Kulottama	Raja Kunjara
32	Ayatana Pravina		Sardula	Pravina	R. Bhayamkara
33	Raja Kunjara		Kavi Raja	K. Kunjara	Wugrasena
34	Pravira Raja Bhayanca-		Kulottama	R. Bhayamkara	Mahasena
35	Varoonajana [ra		Tunda Pravina	Wugra Sena	Satrunjaya
36	Satrunjaya		Raja Kunjara	Satrunjaya	Bhimaratha
37	Viravudanda		Raja Bhayamkara	Jayamgonda	Bhima Paracrama
38	Viraparakrama		Rudrasena	Parakrama	Pratap Martanda
39	Pratapa Martanda		Satrunjaya	Pratap Martanda	Vikrama Kanchuki
40	Vikramakaryaka [la		Vinatar	Vikrama Kunchuka	Yuddha Kolahala
41	Samara Sek'hara Kolata-		Viraprakrama	Samara Kolahala	Chaturi Vikrama
42	Antala Vikrama		Pratapa Martanda	Atula Vikrama	Atula Kirtti
43	Antala Kirtti		Vikramakanchuki	Atula Kirtti	Kirtti Bhushana
44	Vamsa Sek'hara[6]		Samara Kolahala	Kirtti Bhushana	Vamsa Sek'hara
45	Pratapa Surya		Yatula Vikrama	Vamsa Sek'hara	Champaka
46	Vamsatulaja		Yatula Kirtti	Vamsa Churamani, or Chanjpaka	Pratapasurya
47	Nipu Marundari		Kirtti Bhushana	Pratapa Surya	Vamsa Dhwaja
48	Chola Vamsottaraca		Vamsa Sek'hara	Vamsa Dhwaja	Vamsa Bhushana[7]
49	Kula Churamani		Vamsa Churamani	Marutakan	Loma Churamani
50	Raja Churamani		Surya Vanjival Dhwaja	Chola Vamsantaca	Kula Churamani
51	Vamsa Siromani		Marutaka	Chera Vamsantaka	Raja Churamani
52	Pandya Gambhira		Pratapa	Pandya Vamsesa	Bhupa Churamani
53	Kuvalatuja		Sovilanki	Vamsa Siromani	Pandya Kulesa
54	Vamsa Vibhushana		Suvangi Sandha	Pandyeswara	Arimerddhana
55	Kulesa		Vamsa Sek'hara II.	Kulodhwaja	Kunapandya[8] [9]
56	Chola Churamani I.		Vamsa Siromani	Vamsa Vibhushana	

57	Chola Churamani II.		Pandeswara	Chola Churamani	
58	Raja Churamani		Kulutoja	Kula Churamani	
59	Bhupa Churamani		Vamsa Bhushana	Raja Churamani	
60	Kulesa II.		Chola Churamani	Bhupa Churamani	
61	Arimarundana		Kula Churamani	Kulesa	
62	Sek'hara Nat'ha		Raja Churamani	Arimatun	
63	Vira Bhagu		Bhupa Churamani	Jagannath	
64	Vikrama Bhagu		Kulesa	Virabahu.	
65	Pracrama Bhagu		Marutan	Vikramabahu	
66	Durmada		Jagannath	Pragramabahu	
67	Karunya		Virabhagu	Suradamaran	
68	Sarvasasana		Vikramabhagu	Bahubala, or Vaguvalen	
69	Sandhatum		Prakramabhagu	Kunkumatanya	
70	Nagarika		Suratamara	Karpura	
71	Chencalneelyetta		Vaguvalatu	Karunya	
72	Vetteya Vinata		Kunkumatennen	Purushottam	
73			Karpura	Satrusadhana	
74			Karunya	Kuna Pandya,or Sundara	
75			Purushottama		
76			Chitra Satana		
77			Kuna, or Sundara		

1 Nos. 3 and 4 should be taken from the same authority by the title, but they do not agree; the second is really from the Teruvaleyadul, which is usually called the Madura Purana.

2 Varaguna is too early in this list by five or six at least.

3 This list omits here between thirty and forty names, whence it is so much briefer than the rest.

4 We have here eight kings between Rajendra and Sundarapada; the two next have but five. With this correction the three agree tolerably well as far as they go.

5 The names of the Chitra family appear transposed in No. 1, as compared with 4 and 5, else they nearly agree.

6 Differs from the rest in not following Vamsa Sek'hara by Champaka, whom it seems to omit altogether; else the three first lists agree tolerably well.

7 The Halasya here omits seven or eight names.

8 The same here omits ten or eleven names.

9 All the lists, except the first, here close, and with the same prince, or Kuna Pandya, with whom the next series, from the same authority, seems to begin. According to the Vamsavali, the seventy-two kings here enumerated reigned in former ages.

10 In these lists the names are often the same though differently written or expressed. Thus, Antala Kirtti (1), Yatula Kirtti (3), and Atula Kirtti (4), are the same name; and Samara Kolahala (1,3,4) means the same as Yuddha Kolahala, "the exulter in battle."

Continuation of List Nos.

Series II.

1. Soma Sundara
2. Karpura Sundara
3. Kumara Sek'hara
4. Kumara Sundara
5. Shamuk'ha Noya
6. Sasiverna
7. Paruva Mantra
8. Pararaja Sena
9. Mugaratoja
10. Satrubhayamkara
11. Satru Sama
12. Kodocola, or Kodungal

Kali, 305. Interregnum.

Series III.

1. Chandrakula Dipa
2. Pulikodi Paruta
3. Minkodi Paruta
4. Magaratuja
5. Martanda
6. Kuvalayana
7. Gunalaya
8. Virabagu
9. Satru Samkara
10. Vira Verma
11. Vernakulottanga
12. Raja Martanda
13. Kulaverddhana
14. Varapunyachari
15. Kulaverddhana 2d.

Invasion of Bahadur Shah.

Series III.

1. Somasek'hara
2. Soma Sundara
3. Raja Raja
4. ————
5. Raja Kunjara
6. Raja Sek'hara
7. Raja Verna
8. Bharata Raja
9. Kumara Sena
10. Bhímasena
11. Pralupa Raja
12. Varaguna
13. Kumara Sundara
14. Varatunga
15. Kulottunga
16. Sundara Kesara
17. Chandra Kumara

Expelled by Virasek'hara, king of Chola.

Restored by Nagama Nayak.

Here begin the Nayaks of whom we have three Lists, one of which is the present.

	Nayaks of Madura, List 1; or, the Vamsavali, Vol.	Mutiah's List.	3. From the History.
1	Viswanath.	Viswanath.	Viswanath.
2	Perya Kistnapa.	Mootoo Kistnama.	Peryakistnapa.
3	Perya Virapa.	Virapa.	Perya Virapa.
4	Viswapa.	Krishnappa.[2]	Viswapa.
5	Perya Virapa.	Mootoo Virapa.	Kumara Kistnapa.
6	Perya Kistnapa.	Terumalla.	Kasturi Rangapa.
7	Kasturi Rangapa.	Mootoo Virapa.	Mootoo Kistnapa.
8	Mootoo Kistnapa.	Chokanath.	Mootoo Virapa.
9	Mootoo Virapa.	Ranga Crishna Mootoo Virapa.	Terumalla.
10	Terumalla.	Vijayaranga Chokanath.	Mootoo Virapa.
11	Chokanath.	Minacshi Ammaul.	Chokanath.
12	Kistna Mootoo Virapa.		Kistna Mootoo Virapa.
13	Vijaya Ranga, as a minor.		Vijaya Ranga, under the regency of Mongamal.
14	Ditto, as of age.		Ditto, of age.
15	Mangamal,[1] his widow.		Minackshi Ammal, his widow.
16	Vijaya Kumar.		Vijaya Kumara.

1 Should be Minakshi.

2 Mutiah omits the three brothers of Virapa, and goes to his nephew. He omits, also, the regency of Mangamal, and the last prince. These five, added to his eleven, the three lists agree.

List of the Manuscript Translations referred to in the preceding Accounts with reference to the Pages, &c. of the Appendix to the Description of the Mackenzie Collection.

1. Vamsavali of the Chola, Chera, and Pandya Dynasties, extracted from a MS. in the possession of Kalinga Raya: and translated from the Tamil by R. Clarke, Esq. cxxviii. vol. i. art. 1.
2. Genealogy of the Pandya Rajas from the Madura Puranam, composed by Parunjothi. Translated by Srinavasia Brahman. Ibid. i. 12.
3. Origin of Madura, with a List of the Kings (List No. 2), and the Limits of the Country. Translated from a Tamil MS. communicated by Mr. Hurdis, by Srinavasia. Ibid. i. 9.
4. List of the Kings of Pandya from the Teruvaleyadal, or Madura Purana. Extracted and translated by Kavele Venkata Lakshmya. MS.
5. List of the Kings of Pandya, extracted from the Halasya Mahatmya of the Skanda Purana. MS.
6. Raja Cheritee; or, Actions of the Vadaka Rajas of Tanjore, Trichanapali, and Madura. cxxviii. i. 8.

7. Madura Puranam; or, Teruvaleyadal of Paranjoti Tamburan. Translated from the Tamil by a native interpreter. Tamil MSS. or class 3, No. 33. cxciv.
8. Puranam, or Ancient History of Madura. Tamil MSS. or class 3, No. 28. Ibid.
9. An Account of the most esteemed works in the Tamil language; from a paper communicated by Mr. Cochrane.
10. Description of the Dravida country, confined almost to notices of Tamil authors. MSS. class 3. cxcvi.
11. Pandya Raja Kal; a History of the Kings of Pandya Desa. Translated from the Tamil. MSS. class 3, No. 27. cxciv.
12. Account of a hill called Tripurankodum and Skander Mally. MSS. class 3, No. 80. cxcvi.
13. Varaguna Cheritram; a History of Varaguna. MSS. class 3, 26. cxciv.
14. Life of Agastyer. Translated from the Tamil. MSS. class 3, 4. cxcii.
15. Life of Manukyavasager. By Vedanaik Vidhagama Siromani. class 3, No. 3. cxcii.
16. Account of the Sanketar, or Madura College. Translated from a Tamil MS. communicated by Minacshi Nayah. cxxviii. i. 13.
17. Account of Gnyana Siva-achari. By Nital Naina. Class 3, No. 9. cxciii.
18. Konga Desa Raja Chentram; a History of the kings of Congo. cxxx. vol. iii. 6.
19. Sketch of the History of Madura. cxxxii. vol. iv. 17.
20. History of the Kings of Ramnad. Translated from the original of Soma Sundara Pilla, by Cavelly Venkall Ramaswami. cxxxii. vol. iv. 21.
21. Some account of the Setupati, or Ramnad Poligan. Translated at Simoga, by C. O. Ramaswami. Ibid vol. iv. 20.
22. Chronological and Historical Account of the Modern kings of Madura. By Mootiah. Ibid. vol. iv. 4.
23. History of the Telugu Rulers of Madura. Translated by Mr. Wheatley. Ibid. vol. iv. 5-16.
24. Account of the Rajas who held the government of the Samsthan of Madura. By Vijaya Kumara-viswanatt Bhanganu Terumala Naih Gouroo; or, the representative of the family of Terumal Naih. Class 3, 82. clxxxxvi.
25. Account of the Colars. By Minakshi Nayah of Madura. Class 3, 81. Ibid.
26. Account of Malanaudoo, and other places in the Calari country. class 3, No. 37. clxxxxiv.
27. Memoir of Tinnavelly. cxxii. vol iv. 2.
28. Raja Cheritra; or, History of the Princes of the South. Translated from the Tamil by Srinavasia.—*Journal of the Royal Asiatic Society, No. 6, p.* 199—242.

Supplementary Note to the Historical Sketch of the Kingdom of Pandya, by H. H. Wilson.

Shortly after the paper which the Royal Asiatic Society has thought worthy of a place in the present Number of the Journal, the Historical Sketch of the Kingdom of Pandya, was printed, I procured a copy of a valuable work recently transmitted to England from Madras, "Oriental Historical Manuscripts in the Tamil Language; translated, with Annotations, by William Taylor, Missionary." The most important of the manuscripts, now first published by Mr. Taylor, relate to the subject of my Sketch, and constitute materials highly essential to the elucidation of Pandyan history. The chief of them, the "Madura Sthala Purana," is clearly the same as one of my authorities, the "Madura Purana;" and it seems likely that the "Pandion Chronicle," and the "History of the Karnata Governors of Madura," which are also amongst Mr. Taylor's translations, may be identifiable with documents in the "Mackenzie Collection," of which I have made use.

There is, accordingly, a general conformity, as close, perhaps, as could be well expected between the details of Mr. Taylor's authorities and those which I have given; but his conclusions, and those which I have hazarded, do not always coincide. We are most at variance with regard to the chronology of Pandyan history; Mr. Taylor being disposed to assign to persons and events a much higher antiquity than I have ventured to ascribe to them. I am not about to vindicate my views: they are now more fully before the public than they were in the introduction to the "Mackenzie Collection," to which Mr. Taylor necessarily confines his observations; and some correcter notion also may be entertained of the particular authorities which I have taken as my guides. With the present Sketch, and the benefit of Mr. Taylor's translations and remarks, those who are inclined to decide between us are in a condition to form a judgment for themselves.

I should not, therefore, have thought it necessary to have adverted particularly to Mr. Taylor's publication, had it not comprised a statement which it is necessary to correct, that a candid comparison between our deductions may be instituted. Mr. Taylor observes in the preface to his second volume, referring to the notice of Pandya prefixed to the Mackenzie Collection: "One position, relating to the remote origin of the Pandion kingdom, being that to which the most decided objection was felt, as opposed to several authorities, having

been traced to its source, was found to have *no warrant or existence in the manuscript on which its authority was made to rest;* and there must, consequently, have been a mistake in the information on which Mr. WILSON necessarily depended, from his admitted want of acquaintance with the Tamil language." On this statement, I have, by the way, to remark, that the assumption of my depending upon "information," implying, it is to be inferred, verbal information, is gratuitous and mistaken. I trusted to translations—written translations alone; never to verbal information or interpretation. The translations were the work as frequently of European as of native scholars, as specified in the list attached to the Sketch; and in the instance of the authority on which my statement depends, was the performance of R. CLARKE, Esq.

But, which is matter of more moment, Mr. TAYLOR's assertion, that the position is *without warrant or existence in the manuscript on which it rests,* is not only unsupported, but is even contradicted by the proof which he has himself adduced in a subsequent part of his work. The position to which he alludes is the statement, that according to some accounts, "the founder of the Pandya kingdom was one Pandya, a native of Oude;" and for this he says there is no warrant in the authority from which he supposes it to have been derived. All that he discovers in the text is, that in the manuscript "*Madura is merely said to have been founded by an agricultural Pandion from the north.*"* Such is his interpretation of the original and it is very possible that he may be correct; but, with such a passage actually in the original text, he is surely not justified in asserting, that there was *no* warrant nor existence whatever for the statement I had advanced, when, upon his own shewing, expressions so *very similar in their bearing do exist, and warrant, if not the precise words, yet a very similar sense.* Madura and the Pandya kingdom are essentially the same; and whether it was founded by a native of Oude, named Pandya, as I have it, or by an agricultural Pandion from the north, as Mr. TAYLOR states, does not appear to me to be so exceedingly different, that, where the latter occurs, it can be said that there is no warrant for the former. The difference, as far as it extends, appears to be that of translation; and the question of accuracy depends upon the relative competency of the translators. Admitting, however, that Mr. TAYLOR's version is correct, it does not follow that there were no traces whatever of such an interpretation as I have followed, and which, though not perhaps literally, is substantially the same with his own. Authorities may differ as to the period of this event, and its share in the establish-

* Historical Manuscripts, Appendix II. p. 39. Note.

ment of the kingdom of Madura; but their weight is in favour of a colonisation from Northern India. That "Pandya of Oude," or "a northern Pandion," had any personal part in the settlement of the country, is equally improbable.

I am too well pleased to see topics of this nature become the subject of discussion at all to take any exception to Mr. Taylor's arguments: our only chance of coming at the truth is by independent investigation, and a comparison of separate results. I have no purpose, therefore, to impugn his deductions; but I may be allowed to question the value of one of his authorities to which I think he ascribes more weight than it deserves. It is the manuscript in his first volume which he calls "The Supplementary Manuscript;" and which he regards as trustworthy.* I place no great reliance on any of the manuscripts which profess to record the ancient history of the Peninsula, especially in periods of remote antiquity; but there are greater sobriety, consistency, and air of likelihood in some than in others; and in those of the best description, there is a general conformity with each other, or with classical Hindu tradition, which indicates their having been compiled with some conscientiousness and care. The "Supplementtary Manuscript" possesses no such characteristics: it is exceedingly jejune and incoherent. In the first sections, the accounts which it gives of the connexion and intercourse between the Pandya princes of Madura, and the Pandavas of Hastinapura, although suggestsd by some of the adventures of Arjuna, as described in the *Mahabharata*, are wholly incompatible with the details found in that poem. The names of the first dynasty of Madura kings differ from those of every other list yet met with; and there is nothing in the meagre notices of them which gives them in a greater degree the character of realities. Twenty-four princes are enumerated as reigning from the beginning of the Kali age to the year 1183. To this dynasty succeeds Vikramaditya, a prince whom all tradition places in the year of Kali 3044. Having thus so widely antedated the reign of Vikramaditya, the compiler of this document is obliged to extend it in proportion; and, accordingly, it is made to continue until the year of Kali 3179, or nearly 2000 years. We then have the reign of Salivahana for 990 years, and that of Bhoja for a century. In all this interval, or 3086 years, we have notice of only twenty-eight princes of Madura, and names of no more than five. Then commences a Pandya dynasty, in the appellations of the first of which, Soma Sundara, and of his successors, we first meet with any agreement with other and more detailed accounts. Here then we may admit some approach to accuracy;

* Vol. ii. p. 75.

but for all that precedes, the "Supplementary Manuscript" is worthless. The best that can be said of it is that it is a blank, as five names are a very unsatisfactory provision for the record of 3000 years. Notwithstanding, therefore, Mr. Taylor's favourable opinion of the "Supplementary Manuscript," I cannot think that it is to be relied on for an insight into the dark periods of Pandya antiquity; and I am satisfied, that he will find at Madras, amongst the original manuscripts of the Mackenzie Collection, many documents much more worthy of his industry and acquirements.—*Journal of the Royal Asiatic Society, No.* 6, *page* 387—390.

2.—*Observations of the Magnetic Dip and Intensity at Madras.*—*By* T. G. Taylor, Esq. *H. C. Astronomer.*

Notwithstanding the value which has of late years been attached to observations of the Magnetic Dip and Intensity, I may, I believe, safely state, that the whole of British India has failed to put on record a single good set of experiments to this end. With a view to supply this deficiency for *Madras*, I have availed myself of the loan of a very excellent dipping needle, the property of Captain Drinkwater, of His Majesty's ship *Conway*; and of two magnetic intensity needles which were brought out by the same officer, and are the property of Captain James Clarke Ross, R. N. The dipping needle, which was constructed on purpose for the *Conway*, differs, I believe, in no respect from the ordinary construction, save that it is one of the best instruments I have met with, and, as far as I can see, absolutely faultless. The observations for Dip are as follows.

Observations for Dip made at the Madras Observatory, situated in Long. 5*h.* 21*m.* 7*s.* 8 *East of Greenwich, and Lat.* 13° 4′ 8″. 8 *N. on the* 26*th April*, 1837.

With Needle marked No. 1.

Face of Instrument E 2st.

No.	A.	B.	No.	A.	B.
1	7° 26′	7° 28′	2	6° 16′	6° 14′
3	7 6	7 4	4	6 12	6 8
5 Inverted the axis,	7 24	7 17	6	6 4	6 8
7	7 30	7 24	8	6 16	6 22

		Reversed the Poles.			
No.	A.	B.	No.	A.	B.
9	7° 28′	7° 22′	10	6° 34′	6° 38′
11	7 12	7 7	12	6 16	6 21
13	7 16	7 24	14	6 24	6 28
15	7 26	7 23	91	6 27	6 33
Mean,	7° 21′ 0″	7° 18′ 37″		6° 18′ 37″	6° 21′ 30′
		Needle marked No. 2.			
1	7 31	7 20	2	7 2	6 38
3	7 31	7 42	4	7 8	6 58
5 Inverted the axis,	7 42	7 25	6	6 55	6 14
7	7 50	7 30	8	6 45	6 55
		Reversed the Poles.			
9	7 24	7 6	2	6 0	6 21
11	7 26	7 4	4	6 10	6 28
13	6 34	6 44	6	6 15	6 0
15	6 34	6 43	8	6 23	6 4
Mean,	7 19 0	7 11 45		6 34 45	6 34 45

And taking the general mean, we get the true Dip

with Needle	No. 1	6 49 56	No.
ditto ditto	„ 2	6 55 4	
	Mean,	6 52 30	

N. B. The numbers 1, 2, 3, &c. exhibit the order in which the observations were made. During the present century, I cannot find that any observations for Dip have been made at *Madras*, but there is one result on record dated 1775, when Abercrombie found it to be 5° 15′ N.; if this result can be trusted, it would appear that the Dip is on the increase at the rate of 1′ 34″ in a year.

With regard to the needles employed for the magnetic intensity, it may be necessary to state, that they are constructed after the model of that of Professor Hansteen. The needles are cylinders, 2½ inches long and .3 inch in diameter, save that the ends are abruptly sharpened to a point; these needles are freely suspended on their centres by a few filaments of unspun silk, which are hooked on to a brass stirrup, moveable upon the needle; by which means a perfect adjustment to horizontality can be effected; the needle thus suspended is enclosed in a rectangular glass box immediately over a divided circle, from which the arc of vibration can be read off and the number of oscillations counted. The zero of measure here employed, is the time of performing 100 vibrations at a temperature of 60°, commencing with an arc of 20° and ending at from 2° to 4°.—If these measures could be observed to ulti-

mate accuracy, it would be worth while to reduce the times of vibration under these circumstances to the times of describing an infinitely small arc, as has been done by HANSTEEN, and on account of buoyancy, to a vacuum; but since such is not the case, the result will be obtained to all useful accuracy by supposing the correction common to each set of observations, by which the reductions, which are rather operose, are avoided: the reduction to a temperature of 60° is effected by applying the correction, 0,00017 t. (where t represents the time of performing 100 vibrations);—a formula which is derived from experiment. The two needles used in the following observations are distinguished from one another by a sign × on one of them. This needle in *London* at a temperature of 60° performed 100 vibrations in 442,76 seconds of mean time, whereas the other needle performed 100 vibrations under the same circumstances in 461,96 seconds; the former needle is further distinguished from the latter from its having been long in use in England, and as having exhibited a remarkable degree of steadiness in its magnetism during the late magnetical experiments instituted in Ireland under the auspices of the British Association; added to which, these needles are calculated to excite a more than ordinary degree of interest from the circumstance of their having been employed by Sir JOHN ROSS in the perilous North Polar Expedition, from which he has lately so fortunately returned. The observations at *Madras* are as follows.

No. 3, Private mark ×

1837	Arc.	Ther.	Vib.	Mean Time.	Interv.	Mean Int.
				h. m. s.	*s.*	*s.*
April 30th	20° 0	88.0	1	0 43 49.4	302.2	301.57
	12 45	——	101	48 51.3		
	8 15	——	201	53 53.1	301.5	cor. for temp. 1.43
	4 0	——	301	58 54.1	301.0	
						300.14
Another set.	20 0	88.0	1	1 1 49.0	302.2	301.60
	12 45	——	101	6 51.2		
	8 15	——	201	11 52.6	301.4	cor. for temp. 1.43
	4 15	87.8	301	16 53.8	301.2	
						300.17
May 3d	20 0	87.0	1	0 45 37.7	302.5	301.97
	12 45	——	101	50 40.2		
	8 30	——	201	55 42.1	301.9	cor. for temp. 1.38
	5 0	——	301	1 0 43.6	301.5	
						300.59

No. 3, not marked.

				h. m. s.	s.	s.
April 26th	20° 0′	85.2	1	3 43 6.1	311.0	310.70
	12 30	——	101	48 17.1		cor. for temp. 1.31
	9 0	——	201	53 27.5	310.4	
						309.39
April 30th	20 0	87.8	1	1 25 17.3	312.1	311.50
	11 45	——	101	30 29.4		
	7 30	——	201	35 40.7	311.3	
	4 0	87.3	301	40 51.8	311.1	cor. for temp. 1.40
						310.10

or we have for the time of performing 100 vibrations at the temperature of 60° Fahrenheit at *Madras*.

Needle 3, ×	Needle 3.
s.	s.
300.14	309.39
.17	310.10
.59	
Mean, 300.30	Mean, 309.74

If h and h' represent the magnetic intensities at any two places, and T and T′ the times of performing 100 vibrations at those places, then we have

$$\frac{h}{h'} = \left(\frac{T'}{T}\right)^2$$

applying this, the horizontal magnetic intensity for *Madras* (that at *London* being assumed = 1.) becomes

	s.
By Needle No. 3, ×	2,1738
Ditto ditto No. 3,	2,2245

With a view to compare theory with practice, we might now compute the number of oscillations which No. 3 × ought to make at *Madras* from the observed number in *London*; thus, assuming the Dip for *London* to be 69° 10′ N. the formula becomes

$$\left\{3 + \sec.^2 (69^\circ\ 10')\right\}^{\frac{1}{2}} : \left\{3 + \sec.^2 (6^\circ\ 52'\ 30'')\right\}^{\frac{1}{2}} : : \overline{462,76}\Big)^2 : T^2$$

performing the computation T = 344,87 differing to the amount of 44,57 seconds from the observations. This difference between theory and observation, is but one of many instances which have from time to time occurred in the infant state of a science. Observation has led us to a theory, and then again has shewn the incompleteness of such theory. In the case of Magnetism, we have long since been prepared to expect that local causes might considerably interfere with its esta-

blished laws; since one station (the island of *Teneriffe*) has already exhibited some singular anomalies, both in respect to the Dip and Intensity. Under these circumstances it is much to be wished that observations could be multiplied in various parts of India, whereby the law of variation from theory may be detected;—and how is this to be accomplished? My answer is ready:—Let any gentleman who is disposed to undertake a set of magnetic intensity experiments signify his intentions; and I shall have great pleasure in forwarding to him, free of expense, a magnetised and compared needle, provided that I am favored with a copy of the results. In anticipation that there will be several gentlemen disposed to forward this inquiry, I am now preparing several needles for use. All that is necessary is, that the person applying for a needle should be in possession of a good clock or chronometer, and has the means of ascertaining its daily rate.

Madras Observatory, 9th May, 1837.

Note.—We shall be most happy to promote the author's views by making a series of experiments with his needles in Calcutta, and then distributing them to friends in the interior. Of the dip we have a few records, (see Proc. As. Soc. for May). Major B. Blake also brought from England an adjusted intensity needle, but we have not yet been favored with his observations.—Ed.—*Journal of the Asiatic Society of Bengal, No.* 65, *May* 1837, *page* 374—377.

3.—*Report upon a Letter addressed by* M. le Baron de Humboldt *to His Royal Highness the President of the Royal Society, and communicated by His Royal Highness to the Council.*

To His Royal Highness the President and Council of the Royal Society.*

Previously to offering any opinion on the important communication on which we have been called upon to report, we feel that it will be proper to lay before the Council a full account of the communication itself. In this letter M. de Humboldt developes a plan for the observation of the Phenomena of Terrestrial Magnetism worthy of the great and philosophic mind whence it has emanated, and one from which may be anticipated the establishment of the theory of these phenomena.

* This report is taken from the Athenæum of March 1837.

After his return from the equinoctial regions of America, M. de Humboldt, in the years 1806 and 1807, entered upon a careful and minute examination of the course of the diurnal variation of the needle. He was struck, he informs us, in verifying the ordinary regularity of the nocturnal period, with the frequency of perturbations, and, above all, of those oscillations, exceeding the divisions of his scale, which were repeated frequently at the same hours before sunrise. These eccentricities of the needle, of which a certain periodicity has been confirmed by M. Kupffer, appeared to M. de Humboldt to be the effect of a re-action from the interior towards the surface of the globe—he ventures to say of "*magnetic-storms*"—which indicated a rapid change of tension. From that time he was anxious to establish to the east and to the west of the meridian of Berlin, apparatus similar to his own, in order to obtain corresponding observations made at great distances at the same hours, but was for a long period prevented putting his plan into execution by the disturbed state of Germany and his departure for France.

The Baron de Humboldt and MM. Arago and Kupffer having, by the co-operation of many zealous observers, succeeded in establishing permanent magnetic stations extending from Paris to China, M. de Humboldt solicits, through his Royal Highness the President, the powerful influence of the Royal Society in extending the plan, by the establishment of new stations. The plan which he proposes, and which has been successfully carried into execution over a large portion of the north-eastern continent, is, that magnetical observations, whether of the direction of the horizontal and inclined needles, or for the determination of the variations of the magnetic force, should be made simultaneously at all stations, at short intervals of time, for a certain number of hours and at fixed periods of the year, precisely similar to the plan which has been recommended and adopted by Sir John Herschel, with reference to observations of the barometer and thermometer.

Referring in terms of commendation to the magnetical observations which have originated in this country, M. de Humboldt expresses his wish that such observations may, by the adoption of an uniform plan, and by connecting them with the observations now in progress on the continent of Europe and of Northern Asia, be rendered more proper for the manifestation of great physical laws. He then enters into an historical detail of the establishment of stations for magnetical observations, stating the important results obtained by MM. Arago and Kupffer by means of simultaneous observations, which appear to establish the isochronism of the perturbations of the needle at Paris and Kasan, stations separated by 47° of longitude. Under the patronage of the Governments of France, of Prussia, of Denmark, and of Russia,

magnetical observatories have been established at Paris, at Berlin, in the mines of Freyberg, at Copenhagen, in Iceland, at St. Petersburgh, Kasan, Moscow, Barnoul at the foot of the Altai Chain, Nertschintk near the frontiers of China, even at Pekin, and at Nicolajeff in the Crimea.

M. de Humboldt states that the lines representing the horary variations at Berlin, Freyberg, Petersburgh, and Nicolajeff affect parallelism, notwithstanding the great separation of the stations and the influence of extraordinary perturbations; that this, however, is not invariable, since even at small distances, for example, at Berlin and in the mines of Freyberg, one of the needles may shew considerable perturbations, while the other continues that regular course which is a function of the solar time of the place.

The epochs at which it had been proposed that simultaneous observations should be made at all stations were,

20th and 21st of March, 4th and 5th of May, 21st and 22d of June, 6th and 7th of August, 23d and 24th of September, 5th and 6th of November, 21st and 22d of December,	From 4 o'clock in the morning of the first day, until midnight of the second, observing, at least hourly, night and day, at each magnetic station.

But as many observers have considered these as too near to each other, the observations most to be insisted upon are those at the times of the solstices and equinoxes.

England, from the times of Gilbert, Graham, and Halley to the present, observes M. de Humboldt, has afforded a copious collection of materials, adapted to the discovery of the physical laws which govern the changes of the variation, whether at the same place, according to the hours of the day and the seasons of the year, or at different distances from the magnetic equator, and from the lines of no variation. After adverting to the continued observations of Gilpin and of Beaufoy, omitting, however, to mention the important ones by Canton, he observes that the arctic expeditions have furnished a rich harvest of observations to Captains Sabine, Franklin, Parry, Foster, Beechey, and James Ross, and Lieutenant Hood;* and that thus physical geography is indebted to the attempts which have been made to discover the north-west passage, and also to the explorations of the icy coast of Asia, by Wrangel Lutke, and Anjou, for a considerable accession of knowledge on terrestrial magnetism and meteorology. Excited, he

* To this long list we may now add the name of Captain Bach; nor ought the name of Mr. Fisher to be omitted.

observes, by the great discoveries of Oersted, Arago, Ampere, Seebeck, and Faraday; MM. Hansteen, Due, and Adolphe Erman have explored, in the whole of the immense extent of Northern Asia, the course of the isoclinal, isogonal, and isodynamic curves; and M. Adolphe Erman has had the advantage during a long voyage from Kamtschatka round Cape Horn to Europe, of observing the three manifestations of terrestrial magnetism on the surface of the earth, with the same instruments, and by the same methods which he had employed from Berlin to the mouth of the Obi, and thence to the Sea of Okhotsh.

M. de Humboldt remarks that our epoch, marked by great discoveries in optics, electricity, and magnetism, is characterized by the possibility of connecting phenomena by the generalization of empirical laws, and by the mutual assistance rendered by sciences which had long remained isolated. Now, he observes, simple observations of horary variation or of magnetic intensity made at places far distant from each other, reveal to us what passes at great depths in the interior of our planet or in the upper regions of our atmosphere: those luminous emanations, those polar explosions which accompany the "*magnetic storm*" appear to succeed the changes which the mean or ordinary tension of terrestrial magnetism undergoes.

M. de Humboldt considers that it deeply interests the advancement of mathematical and physical sciences that, under the auspices of His Royal Highness the President, the Royal Society should exert its influence in extending the line of simultaneous observations, and in establishing permanent magnetic stations in the tropical regions on both sides of the magnetic equator, in high southern latitudes, and in Canada. He proposes this last station because the observations of horary variation in the vast extent of the United States are yet extremely rare. Those at Salem, calculated by Mr. Bowdich, and compared by Arago with the observations of Cassini, Gilpin, and Beaufoy, may, he remarks, guide the observers in Canada, in examining whether there, contrary to what takes place in Western Europe, the (diurnal ?) variation does not decrease in the interval between the vernal equinox and the summer solstice.

In a memoir published five years ago, M. de Humboldt states that he has indicated as stations extremely favourable for the advancement of our knowledge, New Holland, Ceylon, the Mauritius, the Cape of Good Hope, the island of St. Helena, some point on the eastern coast of South America, and Quebec. In order, he observes, to advance rapidly the theory of the phenomena of terrestrial magnetism, or at least to establish with more precision empirical laws, we ought to extend, and at the same time to vary, the lines of corresponding observations; to distinguish, in the observations, of the horary variations, what is due to the influence of the seasons, to a clear or a cloudy atmo-

sphere, to abundant rains, to the hour of the day or night, solar time; that is, to the influence of the sun, and what is isochronous under different meridians: we ought, in addition to these observations of the horary variation, to observe the annual course of the absolute variation of the inclination of the needle, and of the intensity of the magnetic forces, of which the increase from the magnetic equator to the poles is unequal in the American or Western, and in the Asiatic or Eastern hemispheres. All these data, the indispensable basis of a future theory, can acquire certainty and importance only by means of fixed establishments, which are permanent for a great number of years, observatories in which are repeated at settled intervals and with similar instruments, observations for the determination of numerical elements.

Travellers, remarks M. de Humboldt, who traverse a country in a single direction and at a single epoch, furnish only the first preparations for labours which ought to embrace the complete course of the lines of no variation; the progressive displacement of the nodes of the magnetic and terrestrial equators; the changes in the forms of the isogonal and isodynamic lines; and the influence which, unquestionably, the configuration and articulation of the continents exert upon the slow or rapid march of these curves. He will, he considers, be fortunate if the isolated attempts of travellers, whose cause he has to plead, have contributed to vivify a species of research which must be the work of centuries, and which requires at once the co-operation of many observers, distributed in accordance with a well-digested plan, and a direction emanating from many great scientific centres of Europe; this direction, however, not being for ever restricted by the same instructions, but varying them according to the progressive state of physical knowledge and the improvements which may have been made in instruments and the methods of observation.

In begging His Royal Highness the President to communicate this letter to the Royal Society, the Baron de Humboldt disclaims any intention of examining which are the magnetic stations that at the present time deserve the preference, and which local circumstances may admit of being established. It is sufficient that he has solicited the co-operation of the Royal Society to give new life to a useful undertaking in which he has for many years been engaged. Should the proposition meet with their concurrence, he begs that the Royal Society will enter into direct communication with the Royal Society of Göttingen, the Royal Institute of France, and the Imperial Academy of Russia, to adopt the most proper measures to combine what is proposed to be established with what already exists; and adds, that, perhaps, they would also previously concert upon the mode of publication of partial observations and of mean results.

M. de Humboldt finally refers to the labours and accurate observations of M. Gauss at the Observatory of Göttingen. The methods, however, adopted by M. Gauss being already before the Royal Society, in a memoir which has been communicated by him, renders it unnecessary here to enter into the explanation given of them by M. de Humboldt. He has referred to them in order that those members of the Royal Society who have most advanced the study of terrestrial magnetism, and who are acquainted with the localities of colonial establishments, may take into consideration, whether, in the new stations to be established, a bar of great weight furnished with a mirror should be employed, or whether Gambey's needle should be used: his wish is only to see the lines of magnetic stations extended, by whatever means the precision of the observations may be attained.

M. de Humboldt concludes by begging His Royal Highness to excuse the extent of his communication. He considered it would be advantageous to unite under a single point of view what has been done or prepared in different countries towards attaining the object of great simultaneous operations for the discovery of the laws of terrestrial magnetism.

Having very fully laid before the Council the contents of M. de Humboldt's letter, we have now to offer our opinion upon the subject it embraces. There can, we consider, be no question of the importance of the plan of observation which is here proposed for the investigation of the phenomena of terrestrial magnetism, or of the prospect which such a plan holds out of the ultimate discovery of the laws by which those phenomena are governed. Although the most striking of these phenomena have now been known for two centuries, although careful observations of them have within that period been made, and that still more care and attention have been bestowed upon those more recently discovered, yet the accessions to our knowledge, not only regarding the cause of the phenomena, but even with respect to the laws which connect them, bears a very small proportion to the mass of observations which have been made. This has arisen in a great measure, if not wholly, from the imperfection of the data from which attempts have been made to draw conclusions. Whatever theories may have been advanced in explanation of these phenomena, or attempts made to connect them by empirical laws; still, whenever comparisons have been instituted between the results of observation and such theories or laws, it has, in general, been doubtful whether the discrepancies which have been found might not as justly be attributed to errors in the observations, as to fallacies in the theory or incorrectness in the laws. Under these circumstances, the Royal Society, as a society for the promotion of natural knowledge, cannot but hail with satisfaction a proposition for carrying on observations of phenomena most interest-

ing in their nature and most obscure in their laws, in a manner that shall not only give greater precision to the observations, but at the same time render all the results strictly comparative.

There are, however, other grounds on which such a proposition as that made by M. de Humboldt should be most cordially received by the Royal Society. This society is here called upon, as a member of a great confederation, to co-operate with several other members, already in active co-operation, for the attainment of an object which ought to be common to all; and to such a call the Royal Society can never be deaf. Those who know best what has been done by co-operation on a well-digested system, and what remains undone in many departments of science for the want of it, can best appreciate the benefits that would accrue to science by the adoption of the extensive plan of co-operation advocated by M. de Humboldt. Independently of our acquiring a knowledge of the laws which govern the phenomena here proposed to be observed, we ought to look to the effect which the adoption of such a plan may have on other branches of science. The example being thus once set of extensive co-operation in a single department of science, we may anticipate that it would be eagerly adopted in others, where, although our knowledge may be in a much more advanced state than it is regarding the phenomena of terrestrial magnetism, still much remains to be accomplished, which can scarcely be effected by any other means. We might thus hope to see the united efforts of all the scientific societies in Europe directed to the prosecution of inquiry, in each department of science, according to the plan of co-operation best adapted for its development.

We must now, after these remarks on the general bearing of M. de Humboldt's communication, go somewhat into detail on points connected with it. One point of view in which we consider the proposed plan of great importance, and to which M. de Humboldt has not expressly referred, is this:—However defective ordinary dipping instruments may be considered to be, there are few persons who have had opportunities either of making observations with the ordinary instruments for determining the variation of the needle, or of comparing those made by others by the usual methods with such instruments, who will not admit that these instruments and methods are fully as defective—possibly much more so. Thus, however we may multiply the points on the earth's surface at which such observations may be made, still great uncertainty must always rest upon such determinations of these two important elements; and in all comparisons of such observations with laws, whether empirical or deduced from theory, it will ever be doubtful whether the discordances which may be found are due to errors of observation, or are indicative of the fallacy of these laws. This source of uncertainty must, in a great measure, if not wholly, be

obviated by observations made at fixed stations, with instruments of similar construction, which have been carefully compared with each other. And we have no hesitation in stating our opinion that more would be done in determining the positions of the poles of convergence and of verticity on the earth's surface, and other points most important towards the establishment of any thing like a theory of terrestrial magnetism, by simultaneous observations made at a few well chosen fixed stations, than by an almost indefinite multiplication of observations by the ordinary methods.

That a magnetic chart that should correctly exhibit the several lines of equal variation, Humboldt's "Isogonal Lines," would be of the greatest advantage to navigation, those who are best qualified to judge are most ready to admit. If to these lines were added the isoclinal lines, or lines of equal dip, the value of such a chart would, for the purposes of navigation in particular, be greatly enhanced. Whatever may be the magnitude of the influence of the iron in a ship on its compass needle, the extent of the deviation of the horizontal needle due to that influence, on any bearing of the ship's head, is a function of that bearing and of the dip of the needle at the place of observation. The extent, therefore, of the horizontal deviations, in various bearings of the ship's head, having been ascertained at any port where the dip of the needle is known, their extent at any other place, however distant, at which the dip is also known, may readily be calculated. Consequently, a chart which should correctly exhibit the isoclinal, in conjunction with the isogonal lines, would readily furnish the means of obtaining the correction to be applied to the ship's course by compass, both for the variation of the needle and for the deviation due to the ship's influence upon its compass. Whatever charts of this description may have already been constructed, and whatever materials may exist for the construction of more accurate ones, it is well known that great discrepancies exist among the data requisite for such constructions. And it appears to us that such a careful inquiry into the whole of the phenomena of terrestrial magnetism as is proposed by M. de Humboldt, is the means best adapted to insure the accuracy which would be of such inestimable advantage in this most useful application of scientific knowledge.

Although our views with regard to the stations proper to be selected for permanent magnetical observatories in general accord with those expressed by M. de Humboldt, we shall, we consider, be only conforming to his wishes, if we point out those stations which, from particular circumstances of position, appear most desirable. We consider that it would be of the greatest advantage if two or more permanent magnetical observatories were established in the high latitudes of North America, on account of the proximity of stations so situated at the

northern magnetic poles of convergence and verticity, whether these poles are two different points, or one and the same; indeed, continued observations at such stations would go far to decide this question, highly important in a theoretical point of view. M. de Humboldt has mentioned Quebec as a desirable station. To this place, and also to Montreal, we conceive that an objection exists, of which possibly M. de Humboldt is not aware; many of the houses in those cities are roofed with tinned iron. This objection may not, however, exist in some of the establishments in the vicinity of either of these cities. We consider that the most advantageous positions would be, one near the most northerly establishments in Hudson's Bay, and another at or near to Fort Resolution on Great Slave Lake. As, however, observers in such positions would be placed almost beyond the pale of civilization, we fear that, for some time at least, it would be found quite impracticable to obtain regular observations at these important stations. It would likewise be desirable that there should be a station in Nova Scotia or Newfoundland; the latter would be the preferable position.

If the government of the United States were to give their cordial co-operation to M. de Humboldt's plan, by the establishment of three or more permanent magnetical observatories, in different longitudes, these, with what we may expect to be undertaken by Russia in the extreme north-west, and our own establishments, would afford the means of obtaining a mass of more interesting magnetical observations than could perhaps be derived from any other portion of the earth's surface.

M. de Humboldt mentions New Holland, Ceylon, the Mauritius, the Cape of Good Hope, St. Helena, and a point on the east coast of South America, as desirable stations, and we fully concur in the propriety of the selection. Although Van Diemen's Land, from its greater proximity to the southern magnetic pole, would be a more advantageous position for magnetical observations than Paramatta, yet the circumstance alone of there being an astronomical observatory established at Paramatta, renders it peculiarly adapted for a magnetical station. Possibly circumstances may hereafter admit of magnetical observations being also made at Hobart Town, in conformity with the general plan which may be adopted.

The Island of Ascension, from its proximity to the magnetic equator, would possess peculiar advantages for a magnetical station; but these must, in a great degree, be counterbalanced by the nature of its soil, which, being wholly volcanic, would exert an influence on the needle that would render observations made there of a doubtful character; indeed, the same objection applies to St. Helena and most of the islands of the Atlantic. Some recent observations, those of Lieut. Allen, R. N., in the expedition up the Niger, would point to the

Bight of Benin as a desirable station; but the insalubrity of the climate and other circumstances prevent our recommending its adoption.

M. de Humboldt has not referred to any station in our West Indian colonies, but we consider that circumstances point to Jamaica as a station where it is very desirable that accurate magnetical observations should be made. It is generally considered that the variation there has, for a very long period, undergone but little change; and, on this account alone, it would be very desirable to ascertain, with precision, the amount of the variation, so that hereafter the nature of the changes it may undergo may be accurately determined. Its position also, with reference to the magnetic equator, is one which would recommend it as a magnetical station.*

Although M. de Humboldt has not adverted to any other point besides Ceylon in our Indian possessions, yet no doubt he would, with us, consider it desirable that observatories should be established at different points on the continent of India; and it appears to us that Calcutta and Agra are in positions well adapted for the purpose. As, however, there is an Astronomical Observatory established at Madras, there would be greater facility in obtaining magnetical observations there than at places where no such establishment exists.† We feel assured that the East India Company, which has shewn so much zeal and liberality in the promotion of scientific inquiry, and such a desire for the advancement of scientific knowledge in the extensive possessions under its controul, would afford its powerful assistance in the establishment of observatories for the investigation and determination of the laws of phenomena intimately connected with navigation, and, consequently, with the commercial prosperity of our country.

We consider, also, that Gibraltar and some one of the Ionian Islands are very desirable stations for the establishment of permanent magnetical observatories; and, to come nearer home, that such observatories

* Mr. Pentland, who has been appointed Consul-General to the Republic of Bolivia, having, since the Baron de Humboldt's letter was referred to us, offered his earnest co-operation in the objects contemplated in that letter, we cannot hesitate, now that this has been communicated to us, to recommend that an offer so liberal should be made available to science. If accurate magnetical observations were made at some station on the elevated table-land of Mexico, and simultaneously at another not very distant station, nearly at the level of the sea, we consider that they would determine points relative to the influence of elevation on the diurnal variation, the dip and intensity, respecting which our information is at present, to say the least, extremely deficient.

† It will be observed by the preceding article that the zealous Astronomer of Madras has needed no other incentive to carry on these investigations than the impulse of his own ardent mind. With a munificence highly creditable to a private individual, he has offered to supply the necessary apparatus to any persons willing to undertake a series of experiments, and we hope that by this means several magnetic stations will be established in S. India. Mr. Taylor is at this time on a scientific expedition to the southward, where he has appointed to meet Mr. Caldecott, Astronomer to the new Observatory at Trevandrum, to concert with that gentleman plans for the above purpose, as well as to make magnetic experiments on the route.—*Editor Madras Journal.*

should be established in the north of Scotland and in the west of Ireland.

M. de Humboldt adverts to another very interesting class of magnetical observations, those in the mines of Freyberg. The mines of Cornwall from their great depth, some being 1200 feet below the level of the sea, are peculiarly well adapted for observations of this description; and, from the spirit with which philosophical inquiry has been carried on in that part of England, we do not anticipate that much difficulty would occur in the establishment of a magnetical station in one of these mines.

Having enumerated the stations which by their position appear best adapted to furnish valuable results, and having likewise pointed out the facilities which some afford for the execution of this plan of observation, immediately that the nature of the instruments to be employed has been determined upon, and that such instruments can be provided, it may be proper to advert to stations where, although the same facilities do not exist, we consider that zealous and able observers might be obtained without much difficulty. We conceive that such is the case in Newfoundland, in Canada, at Halifax, Gibraltar, in the Ionian Islands, at St. Helena, and Ceylon; and we have authority for stating that there would be no difficulty in obtaining observers, in the Mauritius, and even at the Colony on the Swan River, the latter being a most desirable station. We have not alluded to the observatory at the Cape of Good Hope; if, however, no such establishment existed, the presence of Sir John Herschel would ensure co-operation there, in any plan calculated to advance scientific knowledge. Thus, altogether, there might be formed a most extensive spread of stations, in which the principal expense would consist in the purchase of the requisite instruments; and the means of establishing stations where the same facilities do not exist might afterwards be taken into consideration. As it would be necessary that, at all the stations, observations of the barometer, thermometer, and of atmospheric phenomena, should be made simultaneously with the magnetical observations, these would altogether form a mass of valuable meteorological information which it would be scarcely possible to collect by any other means.

There is one point in M. de Humboldt's communication on which we have not yet touched: the nature of the instruments best calculated to attain the objects in view by the establishment of magnetical observatories. This is a subject on which it will be most proper to enter fully when their establishment has been determined upon; and we would recommend that then the Committee should be appointed to investigate the subject, and that this Committee should report to the Council of the Royal Society what instruments they consider it would be most advisable to adopt at all the stations, and, at the same time, give in an estimate of the expense that must be incurred for

one complete set of such instruments. We may, however, in the mean time, offer a remark on one apparatus referred to by M. de Humboldt, that of M. Gauss. However well we may consider this apparatus to be adapted for the determination of the course of the regular diurnal variation, yet we apprehend that the great weight of the needles employed would prevent their recording the sudden and extraordinary changes in the direction of the magnetic forces, which are, probably, due to atmospheric changes. Another, and we conceive a very serious objection to this apparatus is, that bars of the magnitude employed must have an influence so widely extended, that there would be great risk of the interference of one of these heavy needles with the direction of another, especially in places where the horizontal directive force is greatly diminished, unless the rooms for observation were placed at inconvenient distances from each other.

By referring to M. de Humboldt's letter, it will be seen that the plan of observation so comprehensively conceived by him, has been most powerfully and liberally patronized by the Governments of France, of Prussia, of Hanover, of Denmark, and of Russia : indeed, it is quite manifest that a plan so extensive in its nature must be far beyond the means of individuals, and even of scientific societies unaided by the Governments under which they flourish. To suppose, even without the example thus held out, that the Government of this, the first maritime and commercial nation of the globe, should hesitate to patronize an undertaking, which, independently of the accessions it must bring to science, is intimately connected with navigation, would imply that our Government is not alive either to the interests or to the scientific character of the country, and would show that we had little attended to the history, even in our times, of scientific research, which has been so liberally promoted by the Government. Although the investigation of the phenomena of terrestrial magnetism was not the primary object of the expeditions which have now, almost uninterruptedly, for twenty years been fitted out by Government,—another of which, and one of the highest interest, is on the point of departure,—yet a greater accession of observations of those phenomena has been derived from these expeditions than from any other source in the same period. We therefore feel assured that, when it shall have been represented to the Government, that the plan of observation advocated by the Baron de Humboldt is eminently calculated to advance our knowledge of the laws which govern some of the most interesting phenomena in physical science ; that it appears to be perhaps the only one by which we can hope ultimately to discover the cause of these phenomena ; and that, from it, results highly important to navigation may be anticipated ; the patronage to the undertaking which is so essential to its prosecution will be most readily accorded. We beg, therefore, most respectfully,

but at the same time most earnestly, to recommend to His Royal Highness the President, and to the Council, that such a representation be made to the Government, in order that means may be ensured for the establishment, in the first instance, of magnetical observatories in those places which, from local or other causes, afford the greatest facilities for the early commencement of these observations.*—*Edinburgh New Philosophical Journal, April—July* 1837, *page* 316—330.

S. Hunter Christie.
9th June 1836. G. B. Airy.

4.—*Remarks on the Gamboge Tree of Ceylon, and Character of Hebradendron, a new Genus of Guttiferæ, and that to which the Tree belongs.*—By Robert Graham, m. d., *Professor of Botany in the University of Edinburgh.*†

There are, in tropical countries, many plants which yield a yellow juice, so nearly resembling Gamboge in external characters, and it is said, even in medical properties, that they have each obtained in their respective countries, the name of Gamboge Plant. These belong to exceedingly dissimilar families, their products are never exported from the countries in which they grow, and they are therefore known not to yield any part of the *Gamboge* of commerce. It has been much doubted, however, whether this is the produce of one plant only, and those Botanists who believe that it is so, differ in opinion as to what that plant is.

Modern Naturalists think this substance is obtained from a plant belonging to the Natural Family of *Guttiferæ*, and they generally differ only in believing, either with Murray, that this plant is *Stalagmitis cambogioides* ; or, with De Candolle, that it is *Garcinia Cambogia* (See *Essai sur les Proprietés Médicales des Plantes*, p. 105). Murray's opinions were founded upon certain MSS. by König, and the examination of a specimen collected by him, both of which were in the possession of Sir Joseph Banks, by whose liberality he was allowed to publish his observations, which appeared in 1789, in the ninth volume of the *Commentationes Societatis Regiæ Scientiarum Göttingensis.*

The Authors of the British and several of the Continental Pharma-

* We have not introduced the Baron de Humboldt's letter to the President of the Royal Society, because our space will not admit of it; moreover, the Report of M. M. Christie and Airy, together with their own admirable observations, gives a conveniently condensed abstract of it, which renders such a step unnecessary.—*Editor Madras Journal.*

† It will be observed by our 14th Number, p. 300, that Dr. Wight has been simultaneously occupied in the examination of this subject, and, in a paper published anteriorly to Dr. Graham's, has proposed a name for the plant yielding the Gamboge more unexceptionable, in our opinion, than *Hebradendron.*—*Editor Madras Journal.*

copeias, have adopted Murray's opinions; but in a paper, read to the Royal Society of Edinburgh, March, 1836, I stated my belief that this acquiescence had been somewhat too hasty; and my belief was founded on the examination of flowering specimens and drawings, with observations made in Ceylon, most obligingly communicated to me by Mrs. Col. Walker, and on the examination of a specimen in fruit transmitted by Mr. Blair to the late Dr. Duncan, now in the Materia Medica Museum of this University.

All the *Gamboge* of *Commerce* is exported, as it appears, from Singapore, and believed to be obtained from Siam. The observations of König were made in Ceylon, and during a short stay in Siam,—but chiefly at the former place, where his specimens must have been gathered; for Murray informs us that all his information in Siam was derived from a Roman Catholic Priest, who gave him a very imperfect description of the tree, and that König himself had never seen it alive, and had not even an opportunity of verifying the meagre description *(descriptio proletaria)* of his informant by procuring a single twig. Out of these materials, however,—viz., the said description, the observations of König made in Ceylon, and portions of a specimen in the Banksian Herbarium, transmitted from thence by König,—does Murray construct the character of his genus *Stalagmitis,* and define his species *cambogioides.* Murray's description is, in some respects, wholly at variance with the only tree which, in Ceylon, yields a matter having all the properties, and answering all the purposes of *Gamboge*; yet in Ceylon, as I have said (I presume from Murray's testimony), König's specimens must have been obtained. Indeed we have another authority than that of Murray for this belief; König himself gives his plant the Singhalese names of *Ghokkatu, Gokathu,* or *Ghotathu,* and *Kanna Ghoraka,* yet there is nothing so easy as to show that the description of *Stalagmitis* by Murray is inapplicable to this plant.*

The specimens which I possess of the Ceylon tree and its product, and the characteristic drawings with which these are accompanied, together with the information I have obtained regarding it, I owe entirely to the great kindness of my most intelligent correspondent, Mrs. Col. Walker; who, conjointly with her husband, is profiting with equal zeal, judgment, and success, by the ample opportunities which they enjoy of cultivating an acquaintance with the Botany of that rich and interesting island, Ceylon. It will give value and authority to these observations, if I make some extracts from Mrs. Walker's letters, in which the tree, in conformity with previously received opinion, is

* These observations regarding the origin of König's specimens, were written before I had the direct testimony of Mr. Brown. In a letter, dated Aug. 3, 1836, which I shall presently quote again, he writes, "*Stalagmitis* of Murray, as you well know, is entirely formed from König's MSS., and a portion of his specimens or rather of one of his specimens, and these specimens, as well as the descriptions, belong to the plant, of Ceylon."

called *Stalagmitis cambogioides*,—and I shall afterwards state what the tree really is.

In her first letter, dated Colombo, 1st July, 1833, Mrs. Walker says, "I have set about the *Stalagmitis cambogioides*, which is at present in fruit, and have drawn a branch, with a section of the fruit. I have likewise procured some Gamboge from the tree; it is brilliant and excellent. It is obtained from two other trees here, the *Garcinia Cambogia* and an unknown tree, which Col. Walker thinks is a *Garcinia* likewise. Specimens from both I shall send you, and drawings* also. The fruit of *G. Cambogia* is much used by the natives in their curries; and I am told, when quite ripe, is a very fine fruit, as large as the *Mangosteen*, which it resembles in form. The native name is *Goraka*. The fruit of *Stalagmitis cambogioides* is much smaller, very sweet when ripe, and by no means disagreeable in flavour. It is called here *Kana* (or eatable) *Goraka*. I have not yet ascertained all the uses made here of Gamboge, but it is certainly employed as a pigment by the native artists. Our servants say it is also used by native practitioners in medicine, and sometimes as a plaster, when first taken from the tree. It does not appear to exude like a gum, but on an incision being made, it issues freely through the pores of the bark, as I saw yesterday on cutting both the *Stalagmitis cambogioides* and *Garcinia Cambogia*. I have been trying it as a paint to-day, and find it as good as any I ever used.† We have no intercourse whatever with Siam, and I fear I can procure you no information from thence. I should think, from the specimen I have already got, that the matter which exudes from the *Stalagmitis cambogioides*, when an incision is made in the bark, is undoubtedly pure Gamboge. I have used it in colouring some of my flowers: it is quite liquid when it issues from the pores of the tree, but soon hardens when exposed to the air. I have not tried the stuff from the *Garcinias*, but it tastes and smells exactly like Gamboge."

Mrs. Walker's next letter is dated Aug. 20, 1834:—she says, "Your letter of February 1833, in which you first mention the subject of Gamboge, I received in June of the same year, and immediately inquired about the plant, which I found to be in fruit. In that state I drew it to the best of my abilities, but put off sending it to you till I had an opportunity of forwarding also, a representation of the flower, which, as many plants here blossom twice in the year, I hoped I might

* I have received excellent drawings of *Garcinia Cambogia* (Willd.), of *Garcinia Cambogia*, β. (Moon), and of the unknown plant alluded to, together with specimens of the two first, but none of the last, which seems a species of *Carallia*. R. G.

† In a note on the back of the drawing, Mrs. Walker says, "It issues from an incision in a thickish liquid state, and of a light yellow colour, but soon hardens when exposed to the air, and becomes of much deeper hue, and is perfectly fit for use in water-colour drawings, as much so as any I ever purchased, which was prepared and sold in the London colour-shops."

not have long to wait for. However, I was mistaken in this; the tree did not blossom till March, 1834. I drew it then, but have not since been able to send it home, not a single ship having sailed from hence to England during that long interval; and, I fear, after all, that you will consider my drawing incomplete, as it is only the barren flower I have had the means of representing. So at least it seems to me, and I got quantities of the blossoms, and examined a great number, and found them all the same. I shall send you specimens for your own examination; but I am sorry to say, they look very shabby and poor. The flower, however, in its best state, is insignificant, and poor-looking. The tree does not grow abundantly nor luxuriantly in the immediate neighbourhood of Colombo. Last January we took a little excursion, and got quite into a forest of *Stalagmitis cambogioides*, and perceiving all the trees had their bark cut off in various places, I concluded the people in the neighbourhood must be in the habit of collecting the gum, and determined to get all the information I could on the subject, for your edification. From a very intelligent native practitioner in medicine, I gained the following :—He told us that Gamboge from the *Stalagmitis*, called by the natives *Gokatu*, or *Kana Goraka*, is generally used by them, both as a pigment and medicinally. For the former purpose it is ground very fine with lime-juice,* and mixed with a pretty strong solution of the gum of the *Wood Apple* (*Feronia Elephantum)*, called in Singhalese, *Diwul*. With the addition of a little Chunam, or Lime, they make a deep orange-colour, both tints being much used in the decoration of their temples, and Boodh himself is always represented in yellow garments. Yellow is indeed the sacred colour, the priests being invariably arrayed in yellow robes.

"As a medicine, the Gamboge is ground to a fine powder, and being mixed with the juice expressed from the leaves of the Tamarind tree, is taken with a little water. This is the most common mode of administering it as an aperient; but when mixed with other ingredients it is considered by native practitioners to be beneficial in many diseases. It is collected by cutting pieces of the bark completely off, about the size of the palm of the hand, early in the morning. The Gamboge oozes out from the pores of the bark, in a semi-liquid state, but soon thickens, and is scraped off by the collectors next morning without injury to the tree, the wounds in the bark readily healing and becoming fit to undergo the operation again. The learned doctor, who gave us this information, presented us with a large pot or jar of Gamboge, and

* In a recent letter to Dr. Christison, Mrs. Walker says that she finds this to be a mistake. As a yellow pigment, the juice is used without any preparation ; the addition of lime juice injuring the colour—an observation which Dr. C. has confirmed by experiment.

promised to send us more, which promise he faithfully kept, and I shall forward specimens to you of his present by the first opportunity. The *Garcinia Cambogia*, of which I transmit you a representation, is one of the most common trees in this neighbourhood, attaining a large size, and is very handsome, with remarkably thick and dark foliage. A quantity of resinous juice proceeds from its bark, in the same manner that Gamboge does from the *Stalagmitis*; but it never seems to harden thoroughly, and no use is made of it by the natives. The outer husk of the fruit, however, is a favourite ingredient in their curries. They prepare it by taking out the pulp and seeds, breaking it to pieces, and putting it in a heap, which is covered for two or three days, till it becomes soft. It is then smoked by burning cocoa-nut shells below the grating on which it is spread. This operation is continued for many days, when it is tied up tight in a bag, and kept for use by being hung, I cannot say in the chimney, for chimneys they have none,—but where it is under the influence of the smoke from their fires when cooking. They also use it in pickling or preserving, along with salt, a kind of small fish, which cured in this way will keep for six or seven months. The flower of No. 2, which I suppose is also a *Garcinia*, differs much from No. 1, but the fruit appears almost the same, and is used by the natives in the same way. They are indiscriminately called Goraka by the Singhalese, but are distinguished by their colour." *

In a subsequent letter, dated January 2, 1835, Mrs. Walker says, "I am convinced *Stalagmitis* produces true *Gamboge*. Dr. Pitcairn is of the same opinion, and desires me to tell you that he has administered it in the same way as it is used medicinally at home, and found its effects precisely the same."

I shall now state what the plant seems to be which is called by Mrs. Walker *Stalagmitis cambogioides*, and what are my reasons for forming the opinion which I entertain.

Linnæus, in his *Flora Zeylanica*, No. 195, under the name *Cambogia*, quotes as a synonym, "Carcapuli Acostæ, fructu malo aureo simili," of Plukenett's *Almagestum Botanicum*; which, if it be the same as the twig figured by Plukenett in his *Phytographia*, *t.* 147, *fig.* 3, seems to me to be *Xanthochymus ovalifolius*.

In the same work, Linnæus also quotes, as a synonym of his Cambogia, the "Arbor Indica, quæ gummi guttam fundit, fructu acido sulcato mali magnitudine" of Commelyn's *Flora Malabarica*, which is certainly "Coddam-pulli" of Rheede in *Hortus Malabaricus*, *Mangostana Cam-*

* No. 1. I believe this to be *Garcinia Cambogia*, Willd., which is *G. affinis* of Wight and Arnott, certainly not of Wallich. No. 2 is probably a *var.* of *G. Kydia* of Roxb., perhaps his *G. purpurea*; but as Roxb. gives no description of *G. purpurea*, the point cannot be determined. It is, no doubt, the *G. Cambogia* β., or Red Garcinia, of Moon's Catalogue. R. G.

bogia of Gærtner, *Garcinia Cambogia* of Desrousseaux and of De Candolle.

Linnæus lastly in the same work, cites as a synonym for his *Cambogia* "Carcapuli Acostæ, arbor Indica gummi guttam fundens, fructu dulci, rotundo, cerasi magnitudine," of Burmann's *Thesaurus Zeylanicus*, which, I think, is certainly *Mangostana Morella* of Gærtner *Garcinia Morella* of Desrousseaux and De Candolle, and, as certainly, *Stalagmitis cambogioides* of Moon's Catalogue of Ceylon Plants, and of Mrs. Walker; but by no means the "*Carcapuli*" of Acosta in his *Tractado de las Drogas*, p. 356; which seems to be *Carcapuli Acostæ* of *Pluk. Alm.* 81, *Garcinia Cambogia* of Desrousseaux.

It would probably be thought tedious and useless to follow the contradictions of authors regarding the identity of these plants, and that which yields Gamboge, from 1748, when the *Flora Zeylanica* was published, to the present day. I shall therefore pass them all over, until I come to the latest. In the excellent "*ProdromusFloræ Peninsulæ Indiæ Orientalis*," published by my friends, Dr. Wight and Mr. Arnott, in 1834, it is stated that *Stalagmitis cambogioides* (of Murray) is a species of Garcinia, and perhaps identical with *Garcinia Cochinchinensis* of Choisy, *Oxycarpus Cochinchinensis* of Loureiro. The whole of the account given by Murray of his *Stalagmitis* appeared to me, at the time I communicated my observations to the Royal Society, so enigmatical that I felt unable to form an opinion as to what it is; but I expressed my fears that the statement of Wight and Arnott only threw out another temptation to blunder; for Murray says, that in his plant, the flowers are arranged on a common footstalk, generally more than an inch long, in the axils of the leaves, jointed and bearing the pedicels, which are twice the length of the flowers themselves, in verticels at the joints, and that the fruit is globular, white, slightly reddened on one side, and sometimes twice the size of a large cherry; while Loureiro and Choisy describe their plant as having clustered nearly sessile flowers, with a pear-shaped reddish-yellow fruit, two inches in diameter. Wight and Arnott further say, that the *Stalagmitis cambogioides* of Moon is the *Xanthochymus ovalifolius* of Roxburgh; but Roxburgh describes his plant as having a three-celled ovary, a fruit as large as a small apple, while the genus is partly characterized by the flowers having five petals, and by the presence of five large truncated glands, alternating with the fasciculi of stamens. On the other hand, Mrs. Walker's drawings, and specimens of the fruit sent by Mr. Blair to Dr. Duncan, show that this, like the fruit of *Garcinia Morella*, is four-celled, and not larger than a cherry; and in the specimens which Mrs. Walker has sent to me, I never find more than four petals, and cannot see a trace of these glands. I only mention these circumstances now, to show the inextricable confusion in which the subject lay, and in which it would have remained, had it not been for Mrs. Walker and

the kindness with which Mr. Brown attended to my request that he would examine the specimens of König in the Banksian Herbarium. This examination has reconciled most of the contradictions of authors in a way which could hardly have been anticipated; the authoritative specimen of König is a compound, and consists of the flowers of *Xanthochymus ovalifolius,* with what seems the branch, leaves, and fruit of the plant which in Ceylon yields Gamboge. I give authority to this statement by quoting the letter of Mr. Brown. "The plant sent pasted by König to Sir Joseph Banks, as one specimen, I have ascertained to be made up of two plants, and very probably of two genera. The union was concealed by sealing wax. The portion in flower, and which agrees in structure with Murray's account, is, I have no doubt, the *Xanthochymus ovalifolius* of Roxburgh. *Stalagmitis* and *Xanthochymus* are therefore one genus, as Cambessèdes has already observed, giving the preference to the earlier name of Murray. This, however, forms but a small part of the whole specimen, the larger portion being, I am inclined to think, the same with your plant, of which I have seen, and I believe still possess, the specimen you sent to Don.* The structure, however, of this greater portion cannot be ascertained from the few very young flower-buds belonging to it. It approaches also very closely, in its leaves especially, to that specimen in Hermann's Herbarium, which may be considered as the type of Linnæus' *Cambogia Gutta.* A loose fruit, pasted on the sheet with König's plant, probably belongs to the larger portion, and resembles Gærtner's *Morella.*"

It appears then that the generic name of *Xanthochymus* must be dropped, and that the species which belonged to this genus must receive the appellation of *Stalagmitis.* It seems too, that the generic character of *Stalagmitis* by Murray, so far as regards the flower and inflorescence, was not taken from the plant he meant to describe, but from the flowers of *Xanthochymus* (*Stalagmitis*) *ovalifolius,* which König had inadvertently fastened to it; and lastly, that it is not known that any specimens of the flowers of the plant which Murray meant to describe, at least not any sufficiently perfect for examination, had been received in Europe, till those arrived which I owe to Mrs. Walker. The examination of these, proves that the plant is no *Stalagmitis.* It differs wholly in the number of the parts of the flower and cells of the fruit, in the structure of the calyx, corolla, and stamens; in the absence of intervening glands between the stamens, in the structure of the leaves, in the appearance of the fruit, and in the structure of the persistent stigma. While I remain quite certain that this plant is the *Garcinia Morella* of Gærtner, an opinion which was first formed from an inspection of the specimen in fruit from Mr. Blair, the examination of Mrs. Walker's specimens has induced me to remove the plant from the genus *Garcinia.* The structure of the stamens is quite

* One of those received from Mrs. Walker.

peculiar, and quite unlike that of any species of *Garcinia* with which I am acquainted, in which the free portion of the filament is thread-like, and the anther bilocular, opening longitudinally. In Mrs. Walker's flowers, on the contrary, the free part of the stamens is thick and clavate, and the anthers open by the complete circumcision of a singular umbilicate, flat, and terminal lid, the elliptical pollen-granules being immersed in cellular substance.

For these reasons, I cannot hesitate in believing that the Gamboge plant of Ceylon belongs to a nondescript genus, characterized especially by the stamens, which have suggested the name of *Hebradendron.* Having communicated this opinion to Mr. Brown, he replied, "In your plant, the structure of the anther is indeed very remarkable, and might well induce you to consider it as forming a distinct genus; but it is right to add, that approaches to this structure, and which serve to explain its analogy with the ordinary structure of the family, exist in *Garcinia,* with which I suppose your plant would agree in its female flower, as well as in fruit."

As I have never seen the female flower, nor any drawing of it, I cannot add to the probability which is given to this conjecture by Mr. Brown having formed it, except by stating, that there are within the persistent calyces of the fruit, abortive filiform stamens, very much resembling those which are found similarly attached to the fruit of *Garcinia.*

The resemblance to the Ceylon plant, of the inflorescence and form of the flower-bud, of *Garcinia elliptica (Wallich's List, No.* 4869), led me to examine its structure in connexion with this subject, and I found it also to have male blossoms, with stamens precisely similar. Sir W. J. Hooker was also struck with the resemblance, and obligingly forwarded to me his specimen for examination. His flowers were further advanced than mine, and on my requesting him to steep one, he sent me drawings which it is impossible to distinguish from those taken from the Ceylon plant. It is unfortunate that we do not know the female flowers in either species; and yet, if I do not misunderstand Mrs. Walker, or if she is not mistaken, which is less likely, the Ceylon plant is monœcious.

It is very certain that the tree of Ceylon yields a *Gamboge,* fit for all the purposes of that from Siam, and equal to it in quality, though from the process by which it is prepared for the market not being so perfect, its appearance is less attractive, and the price must be depreciated till that process is improved. At present, however, we have no direct testimony as to the tree which affords the *Gamboge* of Siam. Its being the same with that which in Ceylon yields this substance may be doubted. It is perhaps, and more probably, a nearly allied species of the same genus; this affinity appearing from the experiments of Dr. Christison, shewing all but an identity of chemical

composition in the product, and from their medicinal effects being precisely the same, as has been proved in Ceylon, and in this country, both by Dr. Christison and myself.

It seems probable, from some parts of the description in the *Flora Indica*, and the quality of the Gamboge yielded by it, that *Garcinia pictoria*, Roxb., may prove to be another species of this genus; but in this conjecture I must be wrong, if Buchanan is correct in considering this the same as *Oxycarpus Indica (Encycl. Methód. Suppl.* 4. 257). I think, however, Buchanan is mistaken, for he deems it, at the same time, synonymous with *Garcinia Indica* of Choisy, and with "Arbor Indica Gummi guttam fundens," &c. of Burmann; while, in fact, the specimen in his Herbarium, from which he makes these references (No. 1118) is *Garcinia cornea*. The locality where *Garcinia pictoria* is found (Wynaad) being limited, and the tree having been, formerly at least, well known at Tellicherry, it is probable that specimens may be procured to ascertain the fact.

Hebradendron.* *Graham.*

Nat. Ord. Guttiferæ.—Class and Ord. Monæcia (or Diæcia ?) Monadelphia.

Gen. Char. Hebradendron. *Flores* diclines. *Masc. Calyx* membranaceus 4-sepalus, persistens. *Corolla* 4-petala. *Stamina* monadelpha, columella 4-gona, antheræ terminales, operculo umbilicato circumscisso. *Fœm.* incognitus. *Bacca* multi (4) locularis, loculis monospermis, staminibus quibusdam abortivis liberis basi circumdata, stigmate sessile lobato muricato coronata. *Cotyledones* crassæ, coadunatæ. *Radicula* centralis, filiformis.—Arbores *foliis integris.*

1. Hebradendron *cambogioides;* floribus masculis axillaribus, fasciculatis; sepalis junioribus subæqualibus; foliis obovato-ellipticis, abrupte subacuminatis.

Synonyms.

Carcapuli Linscot, *Herman. Mus. Zeylan. p.* 26. *Ibid. in Rheed. Hort. Malab.* 1. 42. *in nota.*—Ray, *Hist. Plant.* 2. 1661. *Samuel Dale Pharmacop.* 327.

Arbor Cambodiensis Guttam Gambi fundens. *Pluk. Alm.* 41. *Ibid. Mantissa* 20.

Arbor Indica Gummi guttam fundens, fructu dulci rotundo, Cerasi magnitudine, Carcapuli Acostæ. *J. Burmann. Thesaurus Zeylan.* 27.

Cambogia Gutta. *Linn. Fl. Zeylan.* 87. *(excl. omn. syn. præter. Dale, Ray, Burm. Herm.) N. L. Burmann. Fl. Indic.* 119. *(excl. Syn. Pluk. et Rheed).*

Mangostana Morella. *Gært. Fruct.* 2. *p.* 106. *t.* 105.

Garcinia Morella. *Desrousseaux in Lam. Encycl. Method.* 3. 701. *Pers. Synops.* 2. 3. *Choisy in De Cand. Prodr.* 1. 561.

* From ἑβραιος δενδρον, in allusion to the peculiar dehiscence of the anthers.

Stalagmitis Cambogioides. *Moon's Cat. of Plants in Ceylon, Part I. p.* 73.

Descr. A *Tree* of moderate size. *Leaves* opposite, petiolate, obovato-elliptical, abruptly subacuminate, coriaceous, smooth, shining, dark-green above, paler below, veins in the recent state inconspicuous, especially above; in the dried state, distinct on both sides. *Flowers* unisexual, monæcious, (or diæcious ?). *Male* small (eight to nine lines across), clustered in the axils of the *Petioles,* on short single-flowered peduncles. *Sepals* four, subequal, imbricated, concave, membranous, veined, the outer subentire, and somewhat coriaceous in the bud, the inner sparingly denticulato-ciliate, yellow on the inside, yellowish-white on the outside. *Petals* four, spathulato-elliptical, coriaceous, crenulate, longer than the calyx, yellowish-white, red on the inside near the base, deciduous. *Stamens* monadelphous; column four-sided; *Anthers* in a roundish capitulum, terminal upon a short clavate free portion of the *filament,* opening by the circumcision of a flat umbilicate lid; *pollen* yellow, granules elliptical. No trace of a *Germen. Female Flower* unknown. *Berry* about the size of a Cherry, round, with a firm reddish-brown external coat, and sweet pulp, four-locular, surrounded at the base by the persisting *calyx* and a few free abortive *stamens,* crowned with the four-lobed tubercled sessile *Stigma;* loculament single-seeded. *Seeds* large in relation to the berry, reniform-elliptical, compressed laterally, integuments yellowish-brown, easily separable into two layers; *Cotyledons* thick, cohering into an uniform cellular mass; *radicle* central, filiform, slightly curved.

Native of Ceylon.—For the colour and several other parts of the description, I am indebted to Mrs. Walker.

2. Hebradendron *ellipticum;* floribus masculis axillaribus, fasciculatis; sepalis exterioribus junioribus minoribus; foliis lanceolato-ellipticis, apice sensim attenuatis.

Synonym.

Garcinia elliptica. *Wall. List of Indian Plants, No.* 4869 *(not Choisy in De Cand. Prodr.* 1. 561).

I know nothing of this species, but from the specimens sent by Dr. Wallich to Sir W. J. Hooker's Herbarium and to my own. The specific character which I have drawn up, may therefore seem insufficient to distinguish it; and I might perhaps, have considered it only a *variety* of *H. Cambogioides,* but for the complete identity of form in the specimens from Dr. Wallich; their *prima-facie* difference from any of those received from Mrs. Walker; their considerably larger dissimilar leaves, and also their very different geographical position, less unlikely to possess natives of Siam than of Ceylon, Dr. Wallich's plants were obtained in Silhet.—*Companion to the Botanical Magazine, No.* 19, *page* 193—200.

Literary and Scientific Intelligence.

A correspondent at Ganjam has favoured us with the following notice :—

Ganjam, *30th June,* 1837.

A smart shock of an earthquake was felt here last night about ten o'clock. The ground was violently agitated, and the houses in the town shook so much that the inhabitants ran out into the streets in fright. I have not heard that any buildings actually fell. I send you this notice merely that you may compare notes with other accounts you will doubtless receive from other parts of the country, as so severe a shaking must have been felt a considerable distance.

With reference to the account of the operations at Pamban (see p. 111), we copy the subjoined extract of a letter from Lieut. Lake, of the Engineers, from the Madras *Herald :—*

" An English schooner yesterday (18th July) laden with iron and going to Negapatam, passed through the channel with a tolerable fresh breeze, and the main sail and jib set, in lieu of anchoring to the south and warping through as is customary. She did it at our suggestion as I was anxious to prove to them how easily they *might* do it—the Pilots were much against it. She did not take out a single pound of her cargo, and she drew close upon seven feet of water, and passed through an hour and a half before the tide had ceased flowing. A dhoney, drawing six feet, immediately followed her example, both with perfect safety, and never touched. This is I understand the first instance of an English rigged vessel passing through the channel with her sails set---certainly none have done so since I have been here---the depth is therefore considerably above the seven feet. Up to this date from the 1st, 500 tons of stone have been removed from the main channel."

An obliging correspondent at Malacca has forwarded to us a drawing of the Tapir (sent to the Asiatic Society of Bengal, by Lieut. Mackenzie, of the 48th Regt. M. N. I.) which gives a very correct delineation of that rare and singular animal. It is a female, of enormous bulk, upwards of four feet high. Several friends who saw the animal at Malacca say, that this drawing gives its contour and general characteristics most faithfully. This being the case, it follows that all the published engravings which we have seen require correction. The figure in the English edition of Cuvier, represents a comparatively light and agile animal, quite devoid of the heavy look, cumbrous figure and rugous skin, delineated in our drawing, and which all our inform-

ants say are peculiar characters of the Tapir. The eye is small and dull, the legs massy, the general appearance of the animal clumsy and unwieldy, and the skin about the throat and extremities in folds like that of the rhinoceros---in fact the creature seems to be a link in the pachydermata, between the rhinoceros and the hog.

It is in contemplation to publish an English and Hindustani Dictionary, if sufficient Subscribers can be found to cover the expenses. The work is by a Member of the Madras Civil Service : it is already in manuscript, and, in our next, we hope to be able to give further particulars, and to publish a specimen of the production.

We have received the following communication, and gladly afford it a place in this Journal, with a view to promote enquiry and elicit information on the very curious subject of Mr. Whewell's enquiries, which are exciting so much interest among scientific men in Europe :—

Dear Sir,—The Asiatic Society having been requested by its Patron the Rt. Hon'ble the Governor General, to draw the attention of those of its Members who may be resident within convenient distance from the Sea Coast, to the desiderata published by the Rev. Professor Whewell, in 1833, regarding the phenomena of the Tides, I have been directed to prepare the accompanying copy of the Professor's suggestions for circulation, and to address them to those of the Society's associates and correspondents, whose zeal in the cause of science furnishes an assurance that they will cordially co-operate in obtaining the information required.

As regards the tides of the Indian Ocean, the principal points to be ascertained are,—the exact times of the arrival of the tidal wave (i. e. the times of high and low water) at several stations on the East and West Coasts of the Bay of Bengal, simultaneously observed for one or more lunations—or if practicable for a whole year. If to this information can be added the *tide-lift*, or difference in perpendicular height between high and low water, obtained by means of a pier or a post set up for the purpose, the utility of the register will be much enhanced. The direction and velocity of local currents caused by the tide, with note of the prevailing winds and their action on the tides or the currents, will also be valuable additions.

It is particularly desirable to note the difference of the tide-lift in the two tides which occur within the same 24 hours, to serve as data for calculating what has been called the diurnal irregularity, a phenomenon

now discovered to be dependent on the declination of the moon north or south of the equator, but which has not hitherto been regarded in any of the published Tables of the daily tides, although the differences thus caused are of great magnitude, and are of material importance in the navigation of rivers and shallow seas.

In noting the time, it should be stated whether apparent, or true time, is intended; and if the time of the moon's passage over the meridian is mentioned, it will be a means of checking the rate of the clock.

Those gentlemen who may not be able to take observations themselves, from the situation of their houses or other causes, may frequently be able to instruct and employ a Classy or servant to note daily the most simple and essential points, the time and height of high water.

By way of ensuring results as comparable as possible, the months of July, October, January and April are selected, commencing with the new moon first occurring in each:—but it is by no means intended to restrict observations to these months, as any full period of a lunation will give information whence, what is called, " the tidal establishment" of a port may be deduced.

The Society has no intention of imposing a pecuniary tax on those who are willing to lend their aid in the prosecution of these enquiries; I am therefore directed to request that you will oblige me with a note of any trifling expense to which they may lead, relying, with confidence, on your judgment and discretion to effect the object as cheaply as possible.

I have the pleasure to remain,
Dear Sir,
Yours very faithfully,
J. Prinsep,
Secretary.

Asiatic Society's Apartments, *7th June*, 1837.

Suggestions for Persons who have opportunities to make or collect Observations of the Tides.

" It was shewn by Newton, nearly 150 years ago, that the fact of the Tides and several of their circumstances, resulted from the law of the Universal Gravitation of matter. But in this interval of time scarcely any thing has been done which might enable us to combine into a general view the phenomena of the Tides as they take place in all the different parts of the world; and a very few places have good and continued observations been made and published. It is conceived that by collecting such observations as have been made, or may easily be made, the connexion and relation of the Tides of all the parts of the Ocean may be in a short time clearly made out: and that persons

may be induced to make such careful observations as may serve to be compared with the theory. In this hope the present paper is circulated.

The most useful Observations with reference to our general knowledge of the Tides are the following, beginning with those which are most easily made.

1. The Observation of the Time of High water at a known place, on any day, and especially at new and full moon.

2. The Observation of the Time of High water on several days in succession at the same place.

3. The Observation of the Height of several successive Tides at the same place.

4. Observations of the comparative Time of High water on the same day at different places in the same seas.

1. An Observation of the TIME of High water at a given place on *any* known day may be useful.

If the Time of the *Moon's southing* on the same day be noted, this will facilitate the use of the observation, and will furnish an additional evidence of the correctness of the date.

The Time of High water on the days of *New and Full Moon* is more particularly useful than on other days.

Observations of the Time of High water may be made with sufficient accuracy without a tide-post. A place ought to be selected where the water is tolerably smooth.

2. If there be opportunity at any place, it is desirable to observe the Time of High water *every day for a fortnight.*

If it be ascertained that the two Tides on the same day occur at regular intervals, *one* of them only need be observed.

But there are often irregularities in the relative Times of the morning and evening Tide ; and these irregularities are different for different ages of the moon. In this case *both daily Tides* should be observed.

3. A single observation of the Height of the Tide is not of much value. But a *Series* of Heights *for a fortnight* is valuable, especially if accompanied with observations of the Times.

The morning and evening Tide are often unequal, and this inequality sometimes varies considerably from one fortnight to another.

In Observations of the Height of the Tide, the *difference of High and Low water* ought to be taken.

The channel of a river is *not* a good situation for such Observations.

4. The usefulness of Tide Observations will be greatly increased if those made at places in the same seas can be compared so as to shew the RATE *at which the Tide wave* TRAVELS :

For example, the time which it employs in passing along a certain line of coast, or across a sea, or round an island, or up a bay.

N. B.—The Tide wave is the elevation of the waters by which High water is produced in many places at once. It is not observed as a visible wave, but is found by drawing a line upon the globe through all the places at which it is high water at a certain moment. The rate and direction of its travelling are known by comparing the position of such lines at successive times.

N. B.—The Rate *at which the Tide wave* Travels is quite distinct from the rate at which the stream of ebb or flow *runs.*

N. B.—Also the Direction in which the Tide wave travels is quite distinct from the direction in which the Tide *ebbs or flows.*

The most proper Observations for determining the rate and course of the Tide wave are those of the Time of High water *on the same day at different points* (not too near nor too remote) on a continued line of coast or sea.

This may often be done by a person residing in any country by making enquiries of persons conversant with the coasts, or by directing corresponding observations to be made at different places for a few days only.

If the places differ much in longitude, this ought to be noted, that allowance may be made for the difference of the absolute Time of noon.

If there be any uncertainty as to the rate and course of travelling of the Tide between two places, the doubt may best be removed by obtaining Observations at some intermediate point or points.

It is necessary to distinguish the Time of High water at the *mouth* of a deep bay or sound, from the Time of High water further in. The former is to be taken in all such comparisons as are here spoken of.

Large islands and long promontories much disturb the regular progress of the Tide wave.

Comparative Observations of the *Height* at different places in the same seas, especially if combined with those of the Times, may also be of great value.

All communications concerning any Observations of the above kinds made or to be made in any part of the world will be thankfully received. They may be addressed to the care of the Sec. Asiatic Societies of Calcutta or Madras or direct to

The Rev. W. Whewell, Trinity College, Cambridge;
or, at the Royal Society, London;
or the Astronomical Society, London."

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY FOR THE MONTH OF APRIL, 1837.

Days.	BAROMETER AT Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	THERMOMETER AT Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	RAIN. Sun rise.	Sun set.	Evaporation.	DIRECTION OF WIND. Morning.	Noon.	Evening.	WEATHER. Morning	Noon.	Evening.
1837	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	°	°	°	°	°	°	°	In.	In.	In.						
Apr. 1	29,938	30,010	29,968	29,904	29,896	29,906	—	80,7	84,6	85,0	84,6	84,0	83,7	—	... ...	...	... ...	S	S E	S	Haze F.C.	Th. hz.	Th.haze, lightning
2	,880	—	,918	,872	,872	,878	—	80,5	—	85,7	86,0	84,5	84,0	—	... ...	...	... ...	S W	S E	S E	Clear	Fl. cl.	Haze do. [of rain
3	,895	29,964	,952	,896	,874	,914	—	82,7	86,2	87,0	87,3	84,8	84,2	—	... ...	...	... ...	S	S	S E	Cloudy	Clear	Haze lg. few drops
4	,93,	—	,958	,916	,873	,916	—	81,0	—	86,3	87,2	84,7	83,9	—	... ...	...	...	S	S	S E	Clear	Clear	Haze lightning.
5	,933	29,982	,968	,904	,874	,924	—	80,6	84,9	86,0	86,2	84,2	83,3	—	... ...	...	5,072	S W	S E	S E	Th. haze	Clear	Haze dew do.
6	,916	,978	,962	,900	,872	,910	—	78,4	84,4	86,0	85,4	83,8	82,4	—	... ...	...	... ...	N W	S E	S E	Th. haze	Th. hz.	Haze do. do.
7	,882	,940	,970	,882	,858	,888	—	78,2	84,3	85,6	84,7	83,5	82,3	—	... ...	...	... ...	N W	S W	S E	Th. haze	Th. hz.	Clear do.
8	,856	,938	,912	,852	,850	—	—	79,0	84,1	86,0	86,3	85,2	—	—	... ...	...	... ...	S	S by E	S E	Th. haze	Haze	Haze do.
9	,894	—	,930	,874	—	—	—	80,6	—	86,2	86,7	—	—	—	... ...	...	... ...	S W	S E	S E	Haze	Fl. cl.	Haze lt.& driz.rain
10	,926	30,042	30,010	,960	29,936	29,954	—	82,8	79,7	78,0	80,5	80,9	80,5	—	1,534	...	... ...	S E	N	N	Cloudy	Rainy	Cly.th.lt.&hy. do.
11	,946	29,998	29,974	,934	,930	,970	29,992	76,5	81,4	83,8	84,3	83,5	82,9	82,1	... ...	...	... ...	N	S E	E	Th. haze	Haze	Clear dew.
12	,934	30,014	,984	,934	,920	,946	,968	78,4	83,8	85,8	86,0	84,0	83,4	82,2	... ..	...	—	W	S E	S E	Fl. cl.	Clear	Clear lightning.
13	,946	29,980	,950	,896	,876	,904	,926	79,0	84,3	86,0	86,9	84,8	84,0	82,4	... ...	...	... ...	S W	S E	S E	Haze	Clear	Clear dew.
14	,884	,930	,900	,848	,822	,849	,872	78,6	84,2	86,0	86,3	84,0	83,9	83,7	... ...	...	... ...	S W	S E	S	Clear	Clear	Th. haze dew.
15	,844	,892	,868	,816	,824	,862	—	79,8	84,3	86,7	87,4	84,3	84,0	—	... ...	...	... ...	S W	E	S E	Haze	Haze	Th. haze —
16	,884	—	,918	,884	,880	,924	29,954	82,2	—	85,3	86,0	84,0	83,2	82,6	... ...	...	... ...	W	S E	S E	Haze fl.cl.	Haze	Haze —
17	,900	29,972	,936	,850	,854	,894	,928	78,5	84,2	86,0	86,0	84,6	84,0	84,0	... ...	...	... ...	S W	S E	S E	Fl. cl.	Haze	Haze —
18	,882	,928	,910	,868	,844	,880	,912	80,5	85,2	86,5	87,0	85,1	83,9	83,5	... ...	...	... ...	S W	S E	S E	Haze	Haze	Clear —
19	,844	,896	,870	,808	,804	,834	,870	79,8	86,3	88,6	88,3	86,0	85,0	84 5	... ...	...	2,721	S	S	S	Clear	Clear	Clear —
20	,832	,874	,862	,800	,792	,798	,845	81,3	85,9	92,0	91,7	87,9	85,2	84,4	... ..	...	... ...	S W	S W	S W	Clear	Clear	Clear —
21	,818	,890	,850	,788	,778	,820	,872	81,7	88,2	92,0	89,7	86,8	86,3	85,6	... ...	...	... ...	S W	S E	S E	Clear	Clear	Clear —
22	,848	,920	,880	,830	,800	,828	,888	82,7	90,1	89,3	89,0	86,1	85,4	84,1	0,700	...	... ...	S W	S	S	Fl. cl.	Clear	Clear —
23	,992	30,020	,982	,948	,926	,962	30,000	82,3	86,0	87,5	87,5	85,8	85,4	83,9	... ...	...	... ...	N W	S	S	Cloudy	Clear	Clear dew.
24	,960	,036	30,024	,984	,946	,984	,006	80,0	84,8	86,5	87,0	85,6	85,3	84,4	... ...	...	... ...	S W	S E	S E	Fl. cl.	Clear	Cicar dew.
25	,958	29,996	29,980	,928	,920	,948	29,976	80,1	85,8	87,0	87,0	85,4	85,0	84,1	... ...	...	... ...	S	S E	S E	Clear	Clear	Clear dew.
26	,926	,980	,972	,924	,912	,952	,990	80,1	85,9	86,5	87,3	86,0	85,0	84,4	... ...	...	3,117	W	S E	S E	Clear	Clear	Clear ——
27	,932	30,006	,988	,932	,923	,970	—	80,3	85,8	87,0	87,6	86,3	85,1	—	... ...	...	... ...	W	S E	S E by E	Th.hz.F.C	Haze	Clear lightning.
28	,932	29,986	,970	,916	,904	,924	29,962	81,7	86,3	87,8	87,6	85,7	85,3	84,7	... ...	...	... ...	W	S E	S E	Fl. cl	Clear	Haze do.
29	,940	,992	,964	,906	,860	,884	,928	82,0	87,3	88,2	88,3	86,1	84,9	84,0	... ...	...	... ...	S W	S E	S E	Haze fl.cl.	Haze	Haze do.
30	,892	,920	,892	,852	,822	,868	,888	82,9	88,2	88,7	88,5	86,8	84,8	84,1	... ...	...	... ...	S W	S E	S E	Clear	Clear	Clear do.
Mean	29,905	29,965	29,941	29,887	29,870	29,903	29,932	80,4	85,2	86,6	86,8	85,0	84,2	83,8									

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY FOR THE MONTH OF MAY, 1837.

Days.	BAROMETER AT							THERMOMETER AT							RAIN.		Evaporation.	DIRECTION OF WIND.			WEATHER.		
	Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	Sun rise.	Sun set.		Morning.	Noon.	Evening.	Morning.	Noon.	Evening.
1837	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	o	o	o	o	o	o	o	In.	In.	In.						
May 1	29,894	29,968	29,936	29,873	29,840	29,868	29,914	82,7	88,3	89,6	89,7	87,9	84,5	84,4	... ...	... ...	... ...	S W	S E	S E	Cloudy	Clear	Clear, litng.
2	,892	,960	,940	,882	,854	,878	,900	82,2	88,5	89,0	88,3	85,8	84,7	84,4	... ...	... ...	... ...	S W	S E	S E by S	Cloudy	Clear	Haze do.
3	,886	,962	,914	,872	,832	,889	,910	82,3	88,2	91,3	90,2	87,0	86,7	85,5	... ...	... ...	3,188	S W	S E	S S E	Clear	Fl. cl.	Cloudy do.
4	,886	,922	,898	,838	,808	,834	,876	84,7	89,7	88,8	88,5	86,7	86,2	84,4	... ...	... ...	... ...	S	S E	S E	Clear	Clear	Clear do.
5	,868	,928	,892	,832	,824	,864	—	82,7	89,3	89,3	88,7	86,8	86,0	—	... ...	... ...	... ...	S W	S E	S S E	Clear	Clear	Haze do.
6	,902	,976	,966	,920	.894	,920	29,966	82,9	87,8	88,4	88,8	86,1	86,0	84,8	... ...	... ...	... ...	S	S E	S E	Clear	Clear	Haze do.
7	,946	30,006	,986	,924	—	—	,970	82,7	86,1	86,7	87,1	—	—	84,0	... ...	... ...	... ...	S	S E	—	Th. haze	Th. haze	——— do.
8	,946	29,958	,942	,900	29,860	29,904	,924	81,0	87,2	89,5	89,2	86,4	85,7	85,0	... ...	... ...	... ...	S	S E	S E	Fl. cl.	Haze	Haze do.
9	,908	,948	,922	,874	,844	,904	,934	81,5	88,3	88,9	89,4	87,2	85,5	84,5	... ...	... ...	... ...	S	S E	S E	Clear	Clear	Haze do.
10	,908	,97	,956	,904	—	—	,944	82,2	88,2	88,8	89,5	—	—	85,0	... ...	... ...	3,143	S	S E	—	Haze	Clear	Lightning.
11	,916	,970	,962	,948	—	—	,916	82,9	87,7	88,3	89,0	—	—	85,	... ...	... ...	... ...	S	S E	—	Haze	Clear	do.
12	,896	,938	,950	,940	—	—	,908	81,9	86,4	88,7	89,0	—	—	85,7	... ...	... ...	... ...	S	S E	—	Clear	Clear	do.
13	,894	,930	,936	,926	—	29,890	—	82,2	87,7	88,7	88,8	—	86,3	—	... ...	... ...	... ...	W	S E	—	Haze fl.cl.	Haze	do.
14	,886	—	,916	,916	—	,884	—	84,0	—	88,2	88,3	—	85,6	—	... ...	... ...	... ...	S	S S E	—	Cloudy	Th. haze	do.
15	,862	29,908	,916	,910	29,886	,880	—	81,9	88,0	88,5	88,6	87,5	84,5	—	... ...	... ...	... ...	S W	S E	S E	Th. haze	Th. haze	Haze litng.
16	,862	,902	,908	,914	,900	,900	—	80,2	86,8	88,0	88,5	86,6	85,3	—	... ...	... ...	... ...	W	S E	S E	Haze	Clear	Haze do.
17	,884	,920	,928	,922	,898	,882	29,882	80,9	87,4	88,6	88,6	86,5	85,6	85,0	... ...	... ...	3,010	S W	S E	S E	Clear	Clear	Haze do.
18	,872	,902	,910	,906	,880	,874	—	81,9	87,3	88,8	89,7	86,5	86,3	—	... ...	... ...	... ...	W	E	S E	Haze	Haze	Cloudy do.
19	,854	,872	,884	,874	,854	,850	—	81,5	84,2	85,6	86,0	85,0	84,8	—	... ...	... ...	... ...	W	N E	E	Cloudy	Cloudy	Cloudy do.
20	,829	,860	,868	,854	,838	,832	—	82,9	84,8	86,0	86,2	85,3	85,0	—	... ...	... ...	... ...	W	N E	S E	Cloudy	Cloudy	Cloudy do.
21	,826	—	,858	,839	,815	,818	—	83,2	—	88,3	86,0	4,5	84,5	—	... ...	... ...	... ...	Calm	N W	S	Cloudy	Cloudy	Cl. do. thr.
22	,812	29,836	,845	,850	,838	,840	—	83,4	87,5	87,4	89,6	5,4	85,4	—	... ...	... ...	... ...	—	N E	N E	Cloudy	Cloudy	Cl. do. do.
23	,824	,858	,860	,860	,836	,832	—	82,3	88,3	89,3	88,5	5,3	85,3	—	... ...	... ...	... ...	N	N E	N	Fl. cl.	Cloudy	Fl.cl.do.do.
24	,838	,864	,866	,868	—	—	29,834	83,3	88,2	89,5	89,7	—	—	86,0	... ...	... ...	2,274	N	N E		Haze	Fl. cl.	Light. do.
25	,822	,856	,870	,87	—	—	—	82,6	88,0	90,6	90,8	—	—	—	... ...	... ...	... ...	N W	N E		Haze	Fl. cl.	do. do.
26	,800	,822	,830	,800	29,840	—	—	83,9	83,1	83,3	78,0	5,2	—	—	... ...	2,457	... ...	N E	N W		Cloudy	Cloudy	do. do.
27	,800	,816	,826	,830	—	—	29,830	79,1	81,2	82,0	82,3	—	—	82,4	0,100	... ...	... ...	S S W	S W		Fl. cl.	Cloudy	do. do.
28	,812	—	,846	,814	—	—	,840	79,9	—	84,4	84,4	—	—	82,8	... ...	... ...	... ...	S S W	S W		Haze fl.cl.	Fl. cl.	do. —
29	,818	29,862	,870	,860	—	—	—	78,1	85,2	87,0	88,0	—	—	—	... ...	... ...	... ...	S S W	S		Clear	Clear	do. do.
30	,822	,852	,872	,878	—	—	29,854	80,3	85,9	87,8	89,2	—	—	84,2	... ...	... ...	... ...	S W	S W		Clear	Clear	do. do.
31	,838	,878	,886	,896	—	—	,866	82,2	86,2	88,4	90,6	—	—	85,6	... ...	... ...	3,202	S W	S W		Haze	Fl. cl.	do. do.
Mean	29,865	29,909	29,902	29,881	29,852	29,870	29,898	82,0	87,0	88,0	88,0	85,6	85,5	8,6									

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY FOR THE MONTH OF JUNE, 1837.

Days.	Barometer at Sun rise.	Barometer at 10 A. M.	Barometer at Noon.	Barometer at 2 P. M.	Barometer at Sun set.	Barometer at 8 P. M.	Barometer at 10 P. M.	Thermometer at Sun rise.	Thermometer at 10 P. M.	Thermometer at Noon.	Thermometer at 2 P. M.	Thermometer at Sun set.	Thermometer at 8 P. M.	Thermometer at 10 P. M.	Rain. Sun rise.	Rain. Sun set.	Evaporation.	Direction of Wind. Morning.	Direction of Wind. Noon.	Direction of Wind. Evening.	Weather. Morning.	Weather. Noon.	Weather. Evening.
1837	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	o	o	o	o	o	o	o	In.	In.	In.						
June 1	29,854	29,882	29,892	29,902	—	—	—	82,3	86,8	89,0	90,6	—	—	—	... ...	... ...	... ...	s w	s w		Haze	Fl. cl.	Lightning.
2	,866	,888	,901	,910	—	—	—	84,8	88,3	90,4	94,2	—	—	—	... ...	... ...	... ...	s w byw	w		Cloudy	Fl. cl.	do.
3	,852	,890	,912	,906	—	—	—	86,4	88,6	92,0	94,0	—	—	—	... ...	... ...	... ...	s w byw	w		Cloudy	Fl. cl.	do.
4	,898	—	,930	,920	—	—	—	86,8	—	92,8	95,4	—	—	—	... ...	... ...	... ...	s w	w		Th. haze	Haze	do.
5	,868	29,897	,926	,912	—	—	29,890	86,0	89,8	93,4	91,2	—	—	85,7	... ...	... ...	... ...	s w	s w		Haze	Clear	do.
6	,882	,926	,944	,915	—	—	,886	83,0	89,8	92,6	91,7	—	—	85,7	... ...	... ...	... ...	s s w	s w		Clear	Clear	do.
7	,874	,922	,941	,926	—	—	,892	82,7	91,6	94,0	92,0	—	—	86,3	... ...	... ...	4,437	s s w	N W		Clear	Clear	do.
8	,880	,932	,954	.929	—	—	,900	84,2	90,7	91,0	90,7	—	—	85,8	... ...	... ...	... ...	w	N W		Th. haze	Haze	do.
9	,886	,930	,960	,936	—	—	,890	82,7	90,6	96,0	92,0	—	—	88,4	... ...	... ...	... ...	s s w	s w		Haze	Clear	do.
10	,880	,922	,930	,922	—	—	,890	84,6	90,6	90,5	90,3	—	—	88,0	... ...	... ...	... ...	N W	N E		Fl. cl.	Fl. cl.	do.
11	,884	—	,920	,918	—	—	,868	83,0	—	90,9	91,8	—	—	86,5	... ...	... ...	... ...	s w	s w		Clear	Clear	do.
12	,852	29,906	,912	,898	29,886	—	,880	84,1	92,3	92,0	90,6	88,6	—	86,0	... ...	... ...	... ...	s w	s E	s	Clear	Clear	Th. haze, litng.
13	,874	,906	,906	,894	—	29,903	,914	84,4	88,2	94,0	96,6	—	87,0	87,0	... ...	... ...	... ...	s w	w	s w	Clear	Clear	Cloudy do.
14	,890	,908	,900	,880	—	,913	,912	85,8	89,8	95,0	97,6	—	88,6	87,0	... ...	... ...	4,275	w	w		Cloudy	Clear	Lightning.
15	,894	,902	,898	,890	—	,902	—	84,3	88,2	92,1	95,5	—	88,0	—	... ...	... ...	... ...	w	s w		Clear	Clear	do.
16	,898	,910	,902	,881	—	—	29,848	84,6	88,4	93,2	96,5	—	—	88,0	... ...	... ...	... ...	w	w		Cloudy	Clear	do.
17	,892	,904	,890	,880	—	—	—	83,9	90,2	94,0	94,0	—	—	—	... ...	... ...	... ...	w	w		Haze	Haze	do.
18	,900	—	,844	,764	—	—	—	84,7	—	91,2	92,5	—	—	—	0,107	... ...	... ...	s w	w		Haze	Clear	do.
19	,794	29,832	,812	,790	—	—	—	85,2	90,0	93,0	96,0	—	—	—	... ...	... ...	... ...	s w	N W		Thick hz.	Cloudy	do.
20	,804	,856	,838	,800	—	—	—	86,2	88,3	92,0	92,8	—	—	—	... ...	... ...	... ...	s w	N W		Cloudy	Cloudy	do.
21	,854	,920	,900	,860	29,852	29,900	29,930	86,2	79,0	84,0	85,0	84,8	84,2	83,5	... ...	... ...	4,710	Calm	w	E S E	Cloudy	Cloudy	Cloudy, litng.
22	,886	,932	,922	,900	,848	—	,926	81,7	86,3	88,2	87,8	86,0	—	85,2	... ...	... ...	... ...	s w	s E	S S E	Clear	fl. cl.	Clear do.
23	,908	,952	,936	,908	—	—	,952	82,2	87,6	90,5	90,0	—	—	85,9	... ...	... ...	... ...	s w	N W		Clear	Clear	Thunder do.
24	.944	,968	,950	,908	—	—	,908	80,9	86,2	89,0	90,7	—	—	85,3	... ...	... ...	... ...	N W	N W		Clear	Cloudy	do. do.
25	,944	—	,920	,882	—	—	,906	81,7	—	90,2	92,2	—	—	85,8	... ...	... ...	... ...	w	N W		Haze	Haze	do. do.
26	,892	29,928	,908	,880	—	—	,904	84,2	88,3	92,0	91,6	—	—	85,9	... ...	... ...	... ...	w	w		Clear	Haze	do. do.
27	,872	,938	,922	,884	—	—	,890	83,7	84,3	87,0	88,4	—	—	81,0	... ...	0,077	... ...	s w	w		Fl. cl.	Cloudy	do. do.
28	,870	,912	,904	,872	—	—	—	79,8	83,9	86,3	88,5	—	—	—	... ...	... ...	3,165	s w	w		Cloudy	Cloudy	Lightning.
29	,874	,930	,914	,876	—	29,870	29,904	83,8	86,5	89,3	92.0	—	85,4	84,9	... ...	... ...	... ...	s w	w		Cloudy	Haze	do.
30	,876	,928	,906	,863	—	—	—	83,8	85,8	87,9	88,6	—	—	—	... ...	... ...	... ...	s w	w		Cloudy	Cloudy	do.
Mean	29,878	29,912	29,910	29,887	29,862	29,898	29,899	83,9	88,1	91,2	92,0	86,5	86,6	85,9									

The Instruments with which the foregoing Observations are made, are placed in the Western verandah of the Honourable Company's Observatory, at about 5 feet above the surface of the ground, and 27 feet above the level of the Sea; the Thermometer was made on purpose for the Observatory, and at 75° (the only point at which a comparison has been made) it was found to differ insensibly from the Royal Society's Standard;—the Barometer is one of two Standards which I have lately constructed, and may be depended upon to 0,01 of an inch.

Longitude.....5*h.* 21*m.* 8*s.* E.
Latitude......13° 4′ 85,″ N.

T. G. Taylor,
H. C. Astronomer.